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UNITED STATES
DEPARTMENT OF THE INTERIOR
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BUREAU OF MINES
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INFORMATION CIRCULAR

FIRST ORGANIZATION AND WORK OF THE COAL-MINE INSPECTION DIVISION, BUREAU OF MINES

I. C. 7243,
June 1943.

INFORMATION CIRCULAR

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

FIRST ORGANIZATION AND WORK OF THE COAL-MINE INSPECTION DIVISION, BUREAU OF MINES[1]

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7243."

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INTRODUCTION

By authority of the Federal Coal-Mine Inspection Act of May 7, 1941, Public Law 49--77th Congress, H.R. 2082,[2] a Coal-Mine Inspection Division was established in the Health and Safety Branch of the Bureau of Mines. Funds totaling $729,000 for the operation of the division and for other incidental expenses were provided in an amendment to the Department of the Interior appropriation bill for the fiscal year 1942 (H.R. 4590). A small percentage of these funds was made available on July 1, 1941, and a much greater proportion on October 1, 1941, to defray the expenses of the coal-mine inspection work and incidental activities for the remainder of the fiscal year 1942.

The Coal-Mine Inspection Division is charged with administering the act and is required to compile, analyze, publish, and otherwise make available for public inspection the information obtained under it and to transmit such information to the Director of the Census. The act requires also that the information obtained be reported to Congress, with such findings and comments thereon and such recommendations for legislative action as may be deemed proper.

PUBLIC LAW 49--77th CONGRESS, CHAPTER 87, 1st SESSION, H.R. 2082, AN ACT--APPROPRIATIONS

Provision of funds for the inspection of mines was not included in the original act, except that it "authorized to be appropriated, out of any moneys in the Treasury not otherwise appropriated, such sums as may be necessary for the due execution of the Act." On May 21, 1941, the United States Department of the Interior submitted to the Bureau of the Budget detailed estimates for administering the act. The Bureau of the Budget authorized the placing before Congress of a request for $729,000; this sum was authorized by Congress in the closing days of the fiscal year ended June 30, 1941, and became available for the last 9 months of the fiscal year 1942. A copy of the Department of the Interior Coal-Mine Inspection Appropriation Bill for the fiscal year 1942 (H.R. 4590), showing a break-down of the various necessary units and the personnel for each unit into which the allotment for the past fiscal year was divided is included in this report as Appendix B.

SUPPLIES AND EQUIPMENT

The establishment of the new Coal-Mine Inspection Division required much thought and consideration of the equipment and supplies

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[2] A copy of the Federal Coal-Mine Inspection Act of May 7, 1941, Public Law 49--77th Congress, H.R. 2082, is included in this report as Appendix A.

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sary to enable the new inspectors to carry out the provisions of the Engineers of the established Bureau of Mines Safety Division analyzed prospective needs of these inspectors and prepared an expense estimate ch was included in the detailed estimate submitted to the Bureau of the dget.

The Department of the Interior appropriation bill approved the amount of $98,900 to be used by the inspection service for such non-recurring equipment as furniture, automobiles, typewriters, anemometers, and barometers. These items were purchased and are now available to the inspectors in the field.

THE ADVISORY COMMITTEE

Section 8 of the Federal Coal-Mine Inspection Act (H.R. 2082) provides for the appointment of an advisory committee as follows:

> The Secretary of the Interior, acting through the United States Bureau of Mines, may in his discretion, create and establish an advisory committee composed of not more than six members to exercise consultative functions, when required by the Secretary, in connection with the administration of this Act. The said committee shall be composed of representatives of coal-mine owners and of representatives of coal-mine workers in equal number. The members of said committee shall be appointed by the Secretary of the Interior without regard to the Civil Service laws.

In accordance with this provision, the Secretary of the Interior, Harold L. Ickes, appointed the following committee:

Thomas Kennedy, secretary-treasurer, United Mine Workers of America, Washington, D. C.
Percy Tetlow, industrial representative, United Mine Workers of America, Washington, D. C.
John T. Jones, director, Labor's Non-Partisan League, Washington D. C.
Cadwallader Evans, Jr., vice president and general manager, Hudson Coal.Co., Scranton, Pa.
L. C. Campbell, general manager, Koppers Coal Co., Pittsburgh, Pa.
T. J. Thomas, president, Valier Coal Co., Chicago, Ill.

The first meeting of the advisory committee was held in Washington, D. C., on September 3, 1941, with Oscar L. Chapman, Assistant Secretary of the Interior; R. R. Sayers, Director, Bureau of Mines; D. Harrington, Chief, Health and Safety Branch; J. J. Forbes, Chief, Coal-

Mine Inspection Division; and other representatives of the Bureau of Mines present. Policies and procedures for inaugurating activities under the Federal Coal-Mine Inspection Act were formulated at this meeting. Another meeting of the committee was held in Pittsburgh, Pa., on December 3, 1941, and a third meeting in Washington, D. C., on May 14, 1942. At these later meetings, progress was reported, and future policies of the Bureau of Mines relative to and suggestions for the conduct of the mine inspection work were discussed.

ORGANIZATION

The new Coal Mine Inspection Division was established in the Health and Safety Branch [3] of the Bureau of Mines to administer the requirements of the act. As the act confers neither regulatory nor police powers, the functions of the division are almost wholly investigative, recommendatory, and educational - functions that necessitate handling and correlating a large volume of technical reports and other work. J. J. Forbes, for years in charge of the field safety activities of the Bureau of Mines, was chosen as chief of the division. The Health and Safety Branch [3] of the Bureau of Mines, of which the Coal-Mine Inspection Division is a unit, is headed by D. Harrington.

The allotment of funds provided for employment in the field of 107 coal-mine inspectors of various grades, 5 mining-electrical engineers, 5 mining-explosives engineers, and 14 stenographers and clerks of various grades. This complement of personnel is listed in the copy of the Department of the Interior appropriation bill, which is included in this report as Appendix B. Later in the year, it was necessary to allocate 16 additional clerical positions to the Coal-Mine Inspection field service.

After the funds were made available, considerable time was required by the Civil Service Commission to examine, qualify, certify, and appoint applicants. The personnel was distributed among the various coal fields as nearly in proportion to the tonnage produced as consideration for such other factors as type of mines, employment, and prevailing hazards permitted. The inspectors were placed under the direction and supervision of the supervising engineers of the established districts of the Safety Division of the Health and Safety Branch (see fig. 1) and were assigned to headquarters at strategic places in the coal-mining districts. The clerk-stenographers were assigned to the various district offices. Figure 2 is a map showing the boundaries of these established districts and the location of the various district offices.

The rapid progress in mechanizing coal mines has introduced numerous new hazards, particularly in connection with the use of electricity and

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[3] When the Bureau of Mines was reorganized in July 1942 the name was changed to Health and Safety Service.

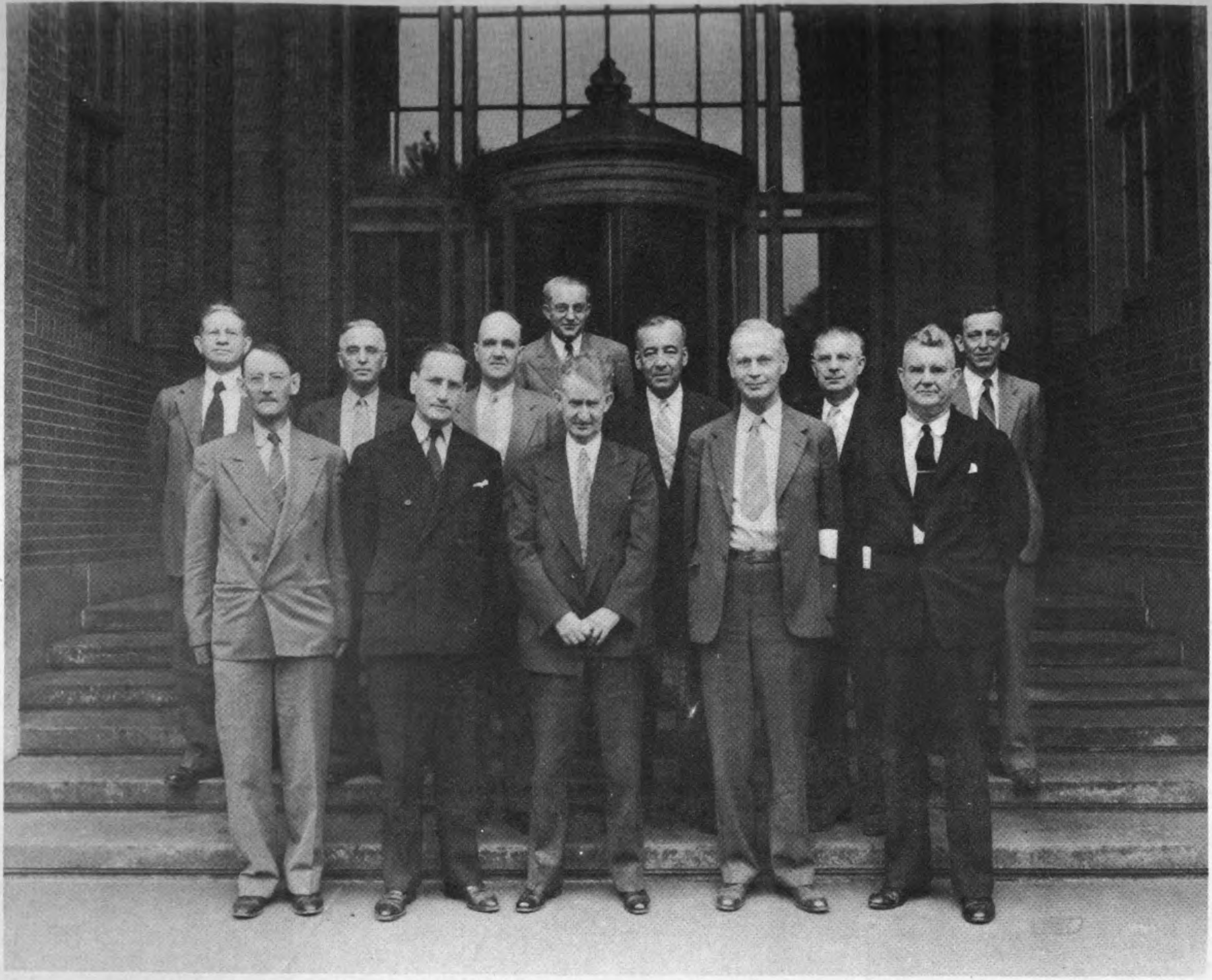

Figure 1.—Supervising engineers, Coal-Mine Inspection Division.

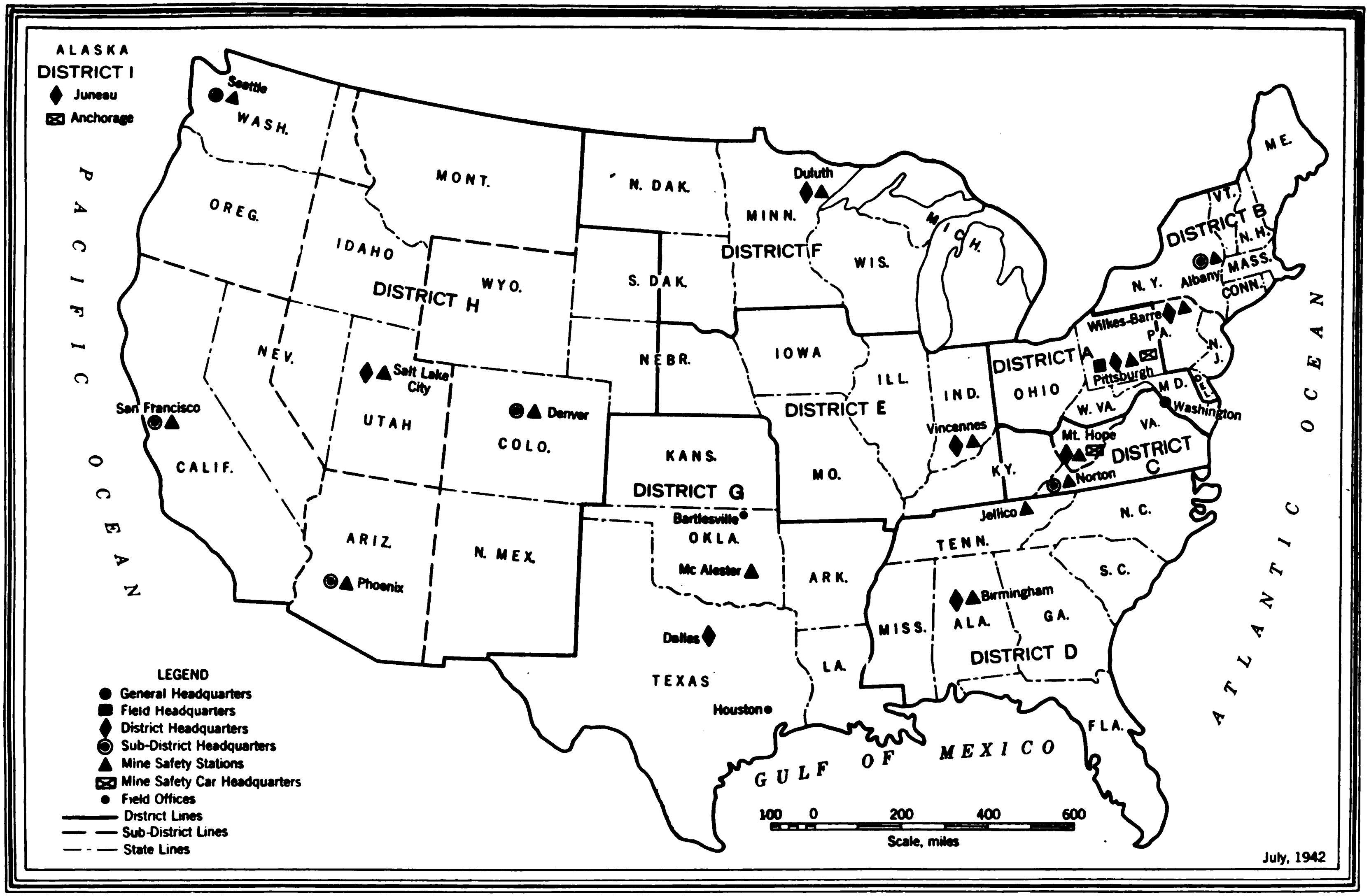

Figure 2.—Map of the United States showing general headquarters, field headquarters, districts, district and sub-district headquarters, location of mine safety stations and field offices, and headquarters of mine safety cars, safety and inspection divisions, health and safety service, Bureau of Mines.

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explosives. Virtually all major coal-mine explosions of the past several years have been initiated either by electricity or by explosives. In addition to these mine-explosion disasters, explosives and electricity cause other types of fatal and nonfatal accidents, indicating that there is definite need for intensive investigations into the use of explosives and electricity in mines. The allotment therefore provides for the employment of five mining-electrical engineers and five mining-explosives engineers to make safety investigations in the application of electricity and explosives to coal mining and to aid and advise the mine-inspection personnel. By the end of the fiscal year (June 30, 1942), two of the five positions of mining-explosives engineers and four of the five positions of mining-electrical engineers had been filled, but the other positions remained vacant temporarily. These engineers are assigned with consideration of the requirements of the various district-office headquarters. Some districts will have both electrical and explosives engineers; other districts will have either an electrical or an explosives engineer only, and the smaller districts possibly will have neither.

The justification for these engineers is included in the Department of the Interior Appropriation Bill for the fiscal year 1942 (H.R. 4590)-(See Appendix B of this report.)

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TABLE 1. - Distribution of inspectors by districts, as of June 30, 1942

States and districts	Number of mines employing more than 25 men	Production, tons	Number of inspectors allotted	Number of inspectors assigned
District A				
Western Pennsylvania	468	108,120,000	18	18
Northern West Virginia	119	30,437,000	7	5
Maryland	55	1,200,000	2	1
Ohio	126	15,000,000	6	4
District B				
Pennsylvania Anthracite	137	50,000,000	10	9
District C				
Southern West Virginia	316	95,131,000	19	15
Eastern Kentucky	193	33,762,000	9	5
Virginia	62	12,283,000	2	4
District D				
Alabama	75	14,615,000	4	4
Tennessee	95	4,450,000	1	1
District E.				
Indiana	69	14,759,000	4	5
Illinois	206	41,912,000	8	7
Iowa	60	3,103,000	1	1
Missouri	15	3,436,000	1	1
Western Kentucky	53	7,969,000	2	-
District F				
North Dakota	13	1,727,000	1	1
Michigan	6	494,000		
District G				
Arkansas	30	1,197,000	-	-
Oklahoma	24	758,000	2	2
Kansas	4	1,921,000	-	-

TABLE 1. - Distribution of inspectors by districts, as of June 30, 1942 (Cont'd)

States and districts	Number of mines employing more than 25 men	Production, tons	Number of inspectors allotted	Number of inspectors assigned
District H				
Utah	19	3,091,000	3	3
Wyoming	25	5,587,000	1	1
Colorado	64	5,683,000	3	3
New Mexico	12	962,000	1	-
Montana	9	2,544,000	-	-
Washington	20	1,524,000	1	-
District I				
Alaska	4	-	1	1
College Park			-	1
In training at Pittsburgh			-	10
Totals			107	[1] 102

[1] 5 vacancies.

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TABLE 2. - Coal-mine inspection personnel, by districts

Name	Title	Headquarters
	District A	
	Supervising Engineer, George W. Grove	
Barry, Anthony J.	Assistant coal-mine inspector	Ebensburg, Pa.
Bloom, Abner K.	Associate coal-mine inspector	Morgantown, W. Va.
Brown, David L., Jr.	Coal-mine inspector	Somerset, Pa.
Burdelsky, Harry R.	Associate coal-mine inspector	Pittsburgh, Pa.
Confer, Ezekiel B.	Associate coal-mine inspector	Clearfield, Pa.
Dalzell, Clarence J.	Coal-mine inspector	Steubenville, Ohio
Davis, Jay C.	Do.	Oakland, Md.
Federoff, James T.	Do.	Uniontown, Pa.
Hall, Luther M.	Associate coal-mine inspector	Buckhannon, W. Va.
Lewis, Edward M.	Coal-mine inspector	Barnesboro, Pa.
Lyons, William L.	Do.	Connellsville, Pa.
Magistrella, Samuel A.	Senior coal-mine inspector	Indiana, Pa.
Maize, Earl R.	Do.	Pittsburgh, Pa.
Maize, K. Noble	Coal-mine inspector	Wheeling, W. Va.
Mechling, Monroe J.	Senior coal-mine inspector	Greensburg, Pa.
Morrow, Alexander E.	Coal-mine inspector	Kittanning, Pa.
Nairn, Alphonsus J.	Senior coal-mine inspector	Waynesburg, Pa.
Newman, George F.	Associate coal-mine inspector	Pittsburgh, Pa.
Null, Victor D.	Assistant coal-mine inspector	Waynesburg, Pa.
Plasky, Joseph J.	Do.	St. Clairsville, Ohio
Simpson, Oscar V.	Senior coal-mine inspector	Do.
Spragg, Clarence	Associate coal-mine inspector	Ebensburg, Pa.
Stahl, R. Ward	Coal-mine inspector	Pittsburgh, Pa.
Stinnette, William E.	Assistant coal-mine inspector	Fairmont, W. Va.
Thomas, Edward	Associate coal-mine inspector	Somerset, Pa.
Toothman, Glenn J. R.	Coal-mine inspector	Washington, Pa.
Walker, W. Dan, Jr.	Senior coal-mine inspector	Fairmont, W. Va.
Yanity, Joseph B.	Associate coal-mine inspector	Athens, Ohio
Griffith, Franklin E.	Mining-electrical engineer	Pittsburgh, Pa.
Auth, Herman C.	Assistant clerk-stenographer	Do.
Comport, Elizabeth	Junior clerk-stenographer	Do.
Flaherty, Mary E.	Do.	Do.
Freedlander, Eudice	Do.	Do.
Hanulik, Martha E.	Do.	Do.
Lipson, Leona	Do.	Do.
Michel, E. Regina	Assistant clerk-stenographer	Do.
Mittereder, Anne K.	Junior clerk-stenographer	Do.
Schor, Dorothy R.	Do.	Do.

TABLE 2. - Coal-mine inspection personnel, by districts (cont'd)

Summary of District A

Senior coal-mine inspectors	6
Coal-mine inspectors	10
Associate coal-mine inspectors	8
Assistant coal-mine inspectors	4
Mining-electrical engineers	1
Mining-explosives engineers	-
Total coal-mine inspectors	29
Clerks	9
Total personnel	38

District B

Supervising Engineer, Simon H. Ash

Name	Title	Headquarters
Bradley, Ira P.	Senior coal-mine inspector	Wilkes-Barre, Pa.
Chitty, Leo	Assistant coal-mine inspector	Do.
Foreit, John W.	Coal-mine inspector	Do.
Franklin, Raymon K.	Do.	Do.
Harrison, Thomas H.	Associate coal-mine inspector	Do.
Hartley, John C.	Coal-mine inspector	Do.
Kopp, Andrew J.	Associate coal-mine inspector	Do.
Scott, Harry L.	Assistant coal-mine inspector	Do.
Wylam, Lawrence L.	Do.	Do.
Weber, Charles F.	Mining-electrical engineer	Do.
Burke, Kathryn M.	Assistant clerk-stenographer	Do.
McGonigle, Marie F.	Do.	Do.

Summary of District B

Senior coal-mine inspectors	1
Coal-mine inspectors	3
Associate coal-mine inspectors	2
Assistant coal-mine inspectors	3
Mining-electrical engineers	1
Mining-explosives engineers	-
Total coal-mine inspectors	10
Clerks	2
Total personnel	12

TABLE 2. - Coal-mine inspection personnel, by districts (cont'd)

Name	Title	Headquarters
	District C	
	Supervising Engineer, Alex U. Miller	
Arnold, Clarence W.	Assistant coal-mine inspector	Mount Hope, W. Va.
Bradburn, John E.	Coal-mine inspector	Norton. Va.
Charlesworth, Arthur	Associate coal-mine inspector	Madison, W. Va.
Colbert, George W.	Assistant coal-mine inspector	Mount Hope, W. Va.
Dodge, Charles H.	Senior coal-mine inspector	Do.
Dougherty, John J.	Associate coal-mine inspector	East Rainelle, W. V
Dukes, Joseph R.	Do.	Pineville, Ky.
Faull, Albion V.	Coal-mine inspector	Prestonsburg, Ky.
Fries, John J.	Do.	Whitesburg, Ky.
Furin, Frank J.	Assistant coal-mine inspector	Norton, Va.
Holt, William	Do.	Do.
Iman, Walter C.	Associate coal-mine inspector	Logan, W. Va.
Keenan, Charles M.	Assistant coal-mine inspector	Hazard, Ky.
Lamb, Warren V.	Senior coal-mine inspector	Mount Hope, W. Va
Lee, Kenneth C.	Associate coal-mine inspector	Williamson, W. Va
Linkous, C. E.	Coal-mine inspector	Logan, W. Va.
Palmer, William S.	Senior coal-mine inspector	Montgomery, W. V
Phillips, William B.	Coal-mine inspector	Mullens, W. Va.
Rachunis, William	Associate coal-mine inspector	Montgomery, W. V
Sanford, Harry E.	Coal-mine inspector	Mullens, W. Va.
Thomas, Clarence J.	Do.	Harlan, Ky.
Tibbals, Charles E.	Do.	Bluefield, W. Va.
Weaver, Harry F.	Associate coal-mine inspector	Norton, Va.
Zeleskey, John	Coal-mine inspector	Welch, W. Va.
Weichel, Thomas R.	Mining-electrical engineer	Mount Hope, W. Va
Fitzgerald, Lloyd G.	Mining-explosives engineer	Do.
Dixon, Frances	Junior clerk-stenographer	Do.
Rogers, Nora V.	Do.	Do.
Weaver, Maybelle C.	Do.	Do.
Schell, Dolly W.	Do.	Norton, Va.

TABLE 2. - Coal-mine inspection personnel, by districts (cont'd)

Summary of District C

Senior coal-mine inspectors	3
Coal-mine inspectors	9
Associate coal-mine inspectors	7
Assistant coal-mine inspectors	5
Mining-eletrical engineers	1
Mining-explosives engineers	1
Total coal-mine inspectors	26
Clerks	4
Total personnel	30

District D

Supervising Engineer, Dorsey J. Parker

Name	Title	Headquarters
Bradford, Robert D.	Associate coal-mine inspector	Birmingham, Ala.
Estep, Roy C.	Do.	Do.
Jack, Alexander	Senior coal-mine inspector	Do.
Smith, Harry N.	Coal-mine inspector	Do.
Vaughn, Everett	Associate coal-mine inspector	Jellico, Tenn.
White, Lorinda F.	Junior clerk-stenographer	Birmingham, Ala.

Summary of District D.

Senior coal-mine inspectors	1
Coal-mine inspectors	1
Associate coal-mine inspectors	3
Assistant coal-mine inspectors	-
Mining-electrical engineers	-
Mining-explosives engineers	-
Total coal-mine inspectors	5
Clerks	1
Total personnel	6

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TABLE, 2. - Coal-mine inspection personnel, by districts (cont'd)

District E

Supervising Engineer, Charles A. Herbert

Name	Title	Headquarters
Brumbaugh, Houston C.	Associate coal-mine inspector	Marion, Ill.
Chick, William R.	Coal-mine inspector	Danville, Ill.
Fields, William G.	Associate coal-mine inspector	Peoria, Ill.
Firth, Joseph W.	Do.	DesMoines, Iowa
Gallagher, William A.	Senior coal-mine inspector	Vincennes, Ind.
Guido, John E.	Assistant coal-mine inspector	Springfield, Ill.
Higgins, Thomas C.	Associate coal-mine inspector	Vincennes, Ind.
Kelly, Leon W.	Coal-mine inspector	Do.
Kessler, Walter W.	Assistant coal-mine inspector	Marshall, Mo.
Odendahl, Walter B.	Coal-mine inspector	Benton, Ill.
O'Neal, Thomas H.	Associate coal-mine inspector	Vincennes, Ind.
Schrecengost, Harry A.	Coal-mine inspector	Springfield, Ill.
Scully, T. Alvin	Associate coal-mine inspector	Vincennes, Ind.
Smith, Francis J.	Coal-mine inspector	Staunton, Ill.
Gallagher, Francis J.	Mining-electrical engineer	Vincennes, Ind.
Malesky, Joseph S.	Mining-explosives engineer	Do.
Adams, Irene W.	Junior clerk-stenographer	Do.
Byers, Helen J.	Do.	Do.
Pfrang, Ethel A.	Do.	Do.
Van Lieu, Georgia L.	Clerk-stenographer	Do.

Summary of District E.

Senior coal-mine inspectors	1
Coal-mine inspectors	5
Associate coal-mine inspectors	6
Assistant coal-mine inspectors	2
Mining-electeical engineers	1
Mining-explosives engineers	1
Total coal-mine inspectors	16
Clerks	4
Total personnel	20

TABLE 2. - Coal-mine inspection personnel, by districts (cont'd)

Name	Title	Headquarters
	District F	
	Supervising Engineer, Frank E. Cash	
London, Walter	Associate coal-mine inspector	Duluth, Minn.
Lundquist, Ellen M.	Assistant clerk-stenographer	Do.
	District G.	
	Supervising Engineer, George M. Kintz	
O'Connor, James A.	Assistant coal-mine inspector	McAlester, Okla.
Westfield, James, Jr.	Coal-mine inspector	Do.
Lorah, Irene H.	Junior clerk-stenographer	Do.
	District H	
	Supervising Engineer, Edward H. Denny	
Arnold, Gerald O.	Senior coal-mine inspector	Salt Lake City, Utah
Christensen, Edward L,	Assistant coal-mine inspector	Denver, Colo.
Holland, Patrick H.	Associate coal-mine inspector	Price, Utah
Morgan, Edward A.	Coal-mine inspector	Denver, Colo.
Reeder, Robert D.	Senior coal-mine inspector	Salt Lake City, Utah
Russell, Horace W.	Associate coal-mine inspector	Denver, Col.
Vittitow, De Jack	Do.	Rock Springs, Wyo.
Ayres, Frances E.	Assistant clerk-stenographer	Denver, Colo.
Rasmusson, S. Ione	Junior clerk-stenographer	Salt Lake City, Utah

Summary of District H

Senior coal-mine inspectors	2
Coal-mine inspectors	1
Associate coal-mine inspectors	3
Assistant coal-mine inspectors	1
Mining-electrical engineers	-
Mining-explosives engineers	-
Total coal-mine inspectors	7
Clerks	2
Total personnel	9

TABLE 2. - Coal-mine inspection personnel, by districts (cont'd)

Name	Title	Headquarters
	District I	
Kazee, Harry H.	Associate coal-mine inspector	Anchorage, Alaska
	College Park, Md., and Washington, D. C.	
East, John H.	Senior mining engineer	Washington, D. C.
Fene, William J.	Do.	Do.
Owings, Clarence W.	Do.	College Park, Md.
Reese, Seth T.	Senior coal-mine inspector	Do.
Brown, Anna P.	Clerk-stenographer	Washington, D. C.
Duke, Virginia M.	Do.	College Park, Md.
Hadley, Betty J.	Junior clerk-stenographer	Washington, D. C.
Pearce, Virginia T.	Do.	College Park, Md.
Ryan, Katherine A.	Do.	Do.
Whittaker, Rowena L.	Junior clerk-typist	Do.

Summary of College Park, Md., and Washington, D. C.

Senior coal-mine inspectors	1
Senior mining engineers	3
Mining engineers	-
Total coal-mine inspectors and mining engineers	4
Clerks	6
Total personnel	10

Personnel in training at Pittsburgh, Pa.

Name	Title	Headquarters
Davis, Malcolm L.	Assistant coal-mine Inspector	Pittsburgh, Pa.
Davis, Robert T.	Do.	Do.
Gammache, Frank J.	Associate coal-mine inspector	Do.
Gilley, James L	Assistant coal-mine inspector	Do.
Hart, David M.	Coal-mine inspector	Do.
Jones, Ralph B.	Assistant coal-mine inspector	Do.
MacLaine, Philip S.	Do.	Do.
Oster, Howard S.	Coal-mine inspector	Do.
Sharp, Arthur L.	Associate coal-mine inspector	Do.
Walsh, Walter H.	Coal-mine inspector	Do.

TABLE 2. - Coal-mine inspection personnel, by districts (cont'd)

Recapitulation of coal-mine inspection personnel, June 30, 1942

District	Senior coal-mine inspectors	Coal-mine inspectors	Associate coal-mine inspectors	Assistant coal-mine inspectors	Mining electrical engineers	Mining explosives engineers	Total	Mining engineers	Clerks	Total personnel
A	6	10	8	4	1	-	29	-	9	38
B	1	3	2	3	1	-	10	-	2	12
C	3	9	7	5	1	1	26	-	4	30
D	1	1	3	-	-	-	5	-	1	6
E	1	5	6	2	1	1	16	-	4	20
F	-	-	1	-	-	-	1	-	1	2
G	-	1	-	1	-	-	2	-	1	3
H	2	1	3	1	-	-	7	-	2	9
I	-	-	1	-	-	-	1	-	-	1
Washington and College Park	1	-	-	-	-	-	1	3	6	10
In training	-	3	2	5	-	-	10	-	-	10
Total	15	33	33	21	4	2	108	3	30	141
Vacancies	-	-	-	5	1	3	9	-	-	-

SELECTION AND TRAINING OF PERSONNEL

Following the passage of the Federal Coal-Mine Inspection Act of May 7, 1941, and the subsequent Department of the Interior appropriation bill allotting the funds for the Coal-Mine Inspection Division effective as of October 1, 1941, the Civil Service Commission posted notice of an open competitive examination, July 14, 1941, to fill the positions created by the Act. The examinations were based on section 9 of the Act, which provides:

> That in the selection of persons for appointment as coal-mine inspectors no person shall be so selected unless he has the basic qualification of at least five years' practical experience in the mining of coal, and is recognized by the United States Bureau of Mines as having the training or experience of a practical mining engineer in those essentials necessary for competent coal-mine inspection. [4]

In line with this provision of the act, the Civil Service Commission consulted the Bureau of Mines regarding the establishment of qualifications for the various grades. By September 8, 1941, a register of eligibles was available, and selection and appointment of personnel were begun. Up to the present, reports from the Civil Service Commission show that 1,329 of 2,219 applicants taking the examination have qualified.

Although the Bureau of Mines was fortunate in obtaining a high type of personnel to fill the inspection vacancies and they were well-qualified as experienced mining men, it was necessary to give them thorough training in Bureau of Mines policies, technology, and procedure before assigning them to duty in the field.

The personnel selected was brought to the Central Experiment Station of the Bureau of Mines, Pittsburgh, Pa., for final physical examination and training reporting in three groups. The first group, comprising 42 inspectors, began the prescribed training on November 17, 1941, completed the training December 23, 1941, and was assigned to field duty.

Bureau facilities utilized in training the inspectors included the personnel of the Central Experiment Station, the Experimental mine, the Explosives Testing Station, and the Safety Division. The training program comprised the following:

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[4] For United States Civil Service Commission announcement of coal-mine inspector examination see Appendix C of this report.

First-aid training (Bureau of Mines course), by N. L. Muir.

Mine rescue training, by H. R. Burdelsky.

Advanced mine rescue training, by F. E. Griffith.

Accident-prevention course for coal-mine officials, by A. U. Miller, W. H. Tomlinson, and S. H. Ash.

Lecture and demonstrations on the use of electricity in coal mining, with special reference to permissible equipment, by E. J. Gleim.

Lecture on the transportation, storage, and use of explosives, with special reference to permissible explosives, by J. E. Tiffany. Visit to the Explosives Testing Station.

Lecture and demonstration on the explosibility of coal dust and the use of rock dust as a preventive measure, by H. P. Greenwald. Visit to the Experimental mine.

Lecture on the health work of the Bureau, by Dr. H. H. Schrenk. Visit to the dust laboratory.

Lecture on the work of the coal laboratory, by H. M. Cooper. Visit to the coal laboratory.

Lectures on flame safety lamps and methane detectors, by A. B. Hooker and L. C. Ilsley. Visits to the electrical laboratory.

Lecture on the effect of temperature and humidity on mine roof, by H. P. Greenwald.

Lecture on the safety-instruction course for coal miners, by E. E. Quenon.

Lecture on the motion-picture work of the Safety Division, by J. W. Pero.

Lecture on the safety-organization work of the Bureau of Mines, by M. J. Ankeny.

Lecture on the use of water and wetting agents for allaying dust in mining operations, by C. W. Owings.

Lecture on mine explosions and fires, by S. H. Ash.

Lecture on metal-dust explosions and incendiary fires, by H. R. Brown.

Lecture on the standard method of collecting mine-air and dust samples, by James Westfield, Jr.

Instructions on procedure and methods to be followed in making mine inspections, by E. H. Denny and S. H. Ash.

Instructions on procedure to be followed in the preparation of inspection reports, by C. A. Herbert and C. W. Owings.

Address on the policies of the Bureau of Mines in coal-mine inspection work, by J. J. Forbes.

Address on the responsibilities of inspectors and importance of inspection work, by D. Harrington.

In addition to the classroom work, lectures, and demonstrations, the inspectors were given actual experience in the inspection of coal mines and in writing reports under the direct supervision of experienced Bureau of Mines engineers. This procedure gave the inspectors valuable and necessary practice in mine-inspection work and in the writing of reports.

The second group of 41 inspectors reported to the Bureau at Pittsburgh on January 5, 1942, and was given essentially the same instruction as the preceding group. This group finished the classroom and lecture work on January 31, 1942, and the members were assigned to the field. Upon arrival at his district headquarters, each new inspector was detailed temporarily to work with a previously trained inspector until he became familiar with the work, then he was assigned to a definite district.

Inspectors of the third group worked with those already in the field in District A until enough were employed to constitute a class; meanwhile, they received instructions in first-aid and mine rescue work. The regular course of training started on May 4, 1942, and was completed on May 21; the 24 men in the class were then assigned to the field.

When the training period was completed on May 21, 1942, only a few of the positions remained vacant, and a well-qualified personnel was ready to represent the Bureau of Mines in mine inspection. At present arrangements are being made to employ the remainder of the inspection personnel authorized. After their appointment has been approved by the Civil Service

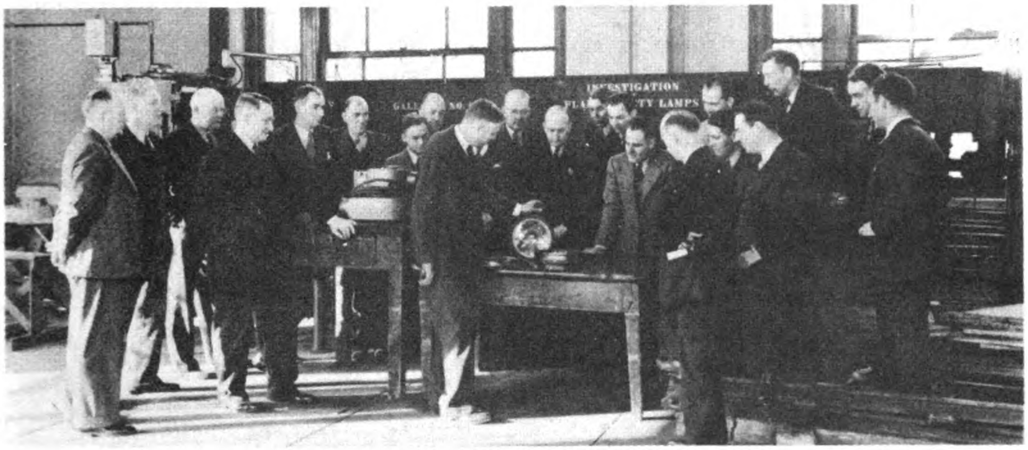

Figure 3. – Instruction of coal-mine inspectors in safe operation of permissible equipment.

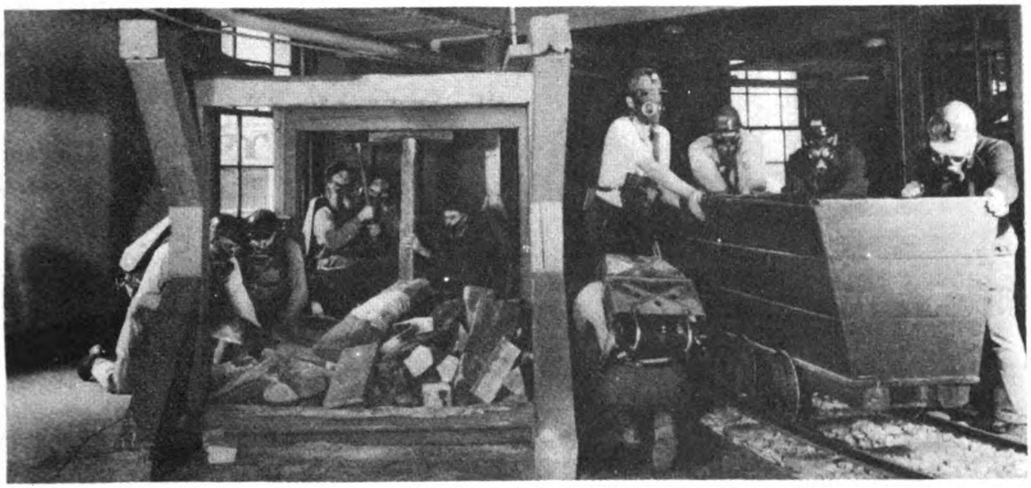

Figure 4. – Coal-mine inspectors wearing breathing apparatus in gas-filled test chamber.

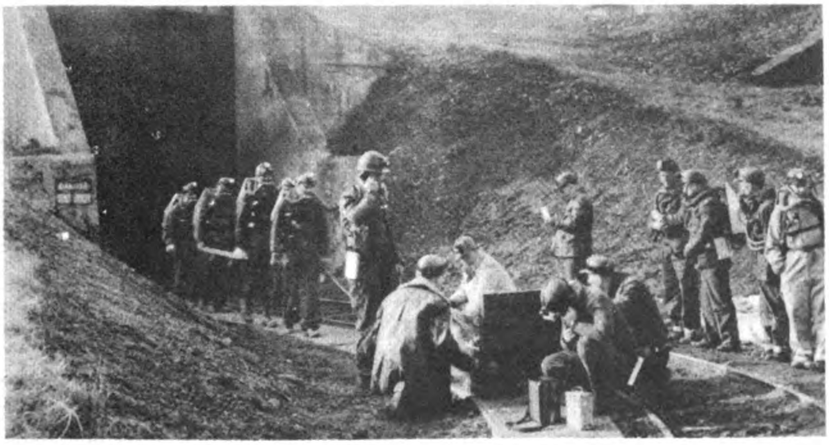

Figure 5. – Coal-mine inspectors searching for "victims" in simulated disaster.

Commission, these men will report early in July for training in essentially the same course as that completed by the other inspectors.

The scope and magnitude of the training program are indicated by the schedule included in this report as Appendix D. Figures 3 to 5 picture phases of the training program.

INSPECTION PROCEDURE AND PUBLICATION OF REPORTS

Between 6,000 and 7,000 coal mines in the United States operate throughout the year, and about an equal number produce coal in relatively small quantities during certain seasons of the year. These 6,000 to 7,000 normally operating mines are situated in 25 States and Alaska; coal is produced in 6 other States to a less extent. Immediate attention is being given at present to the mines employing more than 25 persons each; there are approximately 2,500 of these mines, and in these the services of the 107 inspectors are being utilized. This number of inspectors is inadequate to inspect all of the coal mines of the United States annually, as provided for in the act. The increase in mine-mechanization methods and multiple-shift operation is introducing additional hazards into the coal mines. This condition, together with the fact that 107 inspectors manifestly cannot inspect all the 14,000 or more large and small coal mines, may make it necessary ultimately to increase materially the present force of 107 inspectors.

The inspection of a mine may take 2 days to a few weeks, depending on the size of the mine. The inspectors are required to visit every working place underground, all entrances to abandoned workings, airways, manways, and all other places where men are required to work or travel, in addition to making a careful inspection of the surface plant.

Air samples are collected to determine the quality and quantity of the air at faces of working places, the returns from each split, and the main returns from the mine. Enough dust samples are collected to determine the extent to which the mine is protected by rock dust if rock dust is used. Observations are made concerning conditions and practices with respect to timbering, blasting, electricity, machinery, drainage, haulage, and other features. The accident records of the mine are studied to supplement the information obtained from the inspection of the mine.

While traveling through a mine the inspector points out unsafe conditions and practices to the mine foreman or other mine official who accompanies him. In many instances orders are issued by the mine official for immediate correction of the conditions called to his attention by the inspector. In other instances the inspector confers with the superintendent or higher officials of the company and thereby is able to obtain improvements by voluntary action of the operator.

Immediately after the inspection of a mine is completed, the inspector is required to post a preliminary report[6] at the mine in a place where it will be accessible to the mine employees as well as to the mine operator. The preliminary report outlines briefly safety conditions at the mine and calls attention to hazards that require immediate correction.

After the preliminary report has been posted, the inspector prepares a final report that is virtually a safety engineering report of the mine. This report describes in detail the conditions and practices at the mine, whether good or bad, and makes specific recommendations for correcting of conditions and practices that may cause disasters and other accidents. The report, prepared in longhand, together with the mine maps and the report of noncompliance items used for statistical purposes, is sent to the district office, where it is edited, corrected, and typed. From the district office the report is sent to the Bureau of Mines at College Park, Md., where it is again checked for errors. The report is then forwarded to the Bureau of Mines in Washington, D. C., where subsequently it is made public. Publication of the report comprises forwarding copies (1) to the operating company; (2) to the national office of the United Mine Workers of America and the district office of the United Mine Workers for mines organized by this agency (also to the officials directing the Progressive Mine Workers' organization for the mines under their influence); and (3) to the chief of the State mine-inspection agency and the State mine inspector of the district in which the inspection was made. In addition, the essential facts of the report are abstracted by the Office of Minerals Reports of the Bureau and made available to the public in the form of a press release.

The Federal mine inspector is required to keep the district State mine inspector advised as to his itinerary, so that the local inspector may accompany him if he so desires. On numerous occasions State inspectors have accompanied the Federal mine inspectors and have consulted with them frequently on safety problems arising within their own districts.

INSPECTION WORK ACCOMPLISHED

The first actual inspection of mines under the Federal Mine Inspection Act was made during the week of December 1, 1941, when 13 mines in District A were inspected by small groups of inspectors under the direct supervision of Safety Division engineers. Although these inspections were made principally to train the inspectors, the inspections and the reports resulting therefrom were official and therefore were published. Inspection of mines by Federal coal-mine inspectors on their own responsibility began on January 1, 1942. From this date, when the first group of inspectors was assigned to the field, to June 30, 1942, 160 mine inspection reports had cleared through the Washington office of the Bureau of Mines and had been published; however, at the close of business on June 30, 1942, 400 mines in 20 States had been inspected. The difference in number of reports submitted and number of inspections made is due to lack of clerical help in the district offices. This condition, however, is gradually being corrected.

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[6] See copy of preliminary report form, Appendix E.

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TABLE 4. - Record of mine inspections by districts, December 1, 1943, to June 30, 1942

District		Number of mines inspected	Total production represented, tons	Total employment represented
A	Pittsburgh, Pa.	160	58,831,404	46,025
B	Wilkes-Barre, Pa	28	9,377,599	16,074
C	Mount Hope, W.Va.	85	32,008,529	25,119
D	Birmingham, Ala.	29	8,070,432	9,894
E	Vincennes, Ind.	53	22,707,733	14,229
F	Duluth, Minn.	3	214,490	172
G	Dallas, Texas	7	356,188	564
H	Salt Lake City, Utah	35	6,403,267	5,269
J	Juneau, Alaska	-	--	--
	Total	400	137,969,642	117,346

Of the 14,000 or more large and small coal mines in the United States, 400 were inspected during the 7-month period. December 1 to June 30; although this represents 2.8 percent of all mines it constitutes 16 percent of the approximately 2,500 mines employing more than 25 persons each. These 400 mines represent a coal output of 137,969,642 tons, based on 1941 production figures, compared with a total coal production of 556,970,000 tons for the United States; therefore, mines supplying 24.7 percent of the annual production were examined during the 7-month period. They represent also an employment of 117,346 persons compared with the total employment of 537,000 persons in the entire coal-mining industry of the United States, based on Bureau of Mines employment figures for 1941. Therefore, mines representing 21.9 percent of the total employment were examined during the 7-month period. Although these percentage figures may seem small, attention is called to the fact that only a few inspections were made in December for training purposes and that after January 1 the inspectors were assigned to the field in groups as they completed their training. Because of the irregularity with which the inspectors completed their training and were assigned to the field, it is impossible from the foregoing figures to determine with certainty how adequately the 107 inspectors will be able to cover the entire coal-mining field. More dependable figures will be available at the end of the next fiscal year, when the 107 inspectors will have been inspecting mines for the entire period of 1 year. It is obvious, however, that 107 inspectors are not enough to inspect each mine annually as provided for in the act.

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MINE EXPLOSIONS AND FIRES

An important activity of the Bureau of Mines has been the study of mine explosions and fires. Virtually every mine fire and explosion in the United States that has involved the loss of life or developed into dangerous proportions during the past 32 years has been investigated by members of the Bureau to determine the cause. Local conditions are studied, and a report is prepared in which details of a disaster are discussed and recommendations are made to prevent a similar occurrence.

Inspectors of the Coal-Mine Inspection Division cooperated with engineers of the Safety Division in conducting the recovery work and in investigating four mine explosions and one mine fire during the year. Eight major disasters in which 142 lives were lost occurred during the year.

These mine explosions and fires are listed in table 5.

ACHIEVEMENTS IN THE IMPROVEMENT OF CONDITIONS IN MINES

The Federal inspection of mines has not been in operation long enough to determine how much effect it will have on the mine disaster and accident records of the country.

At no time in the history of the United States have inspection of coal mines and the resulting improvement in safety conditions been more necessary than in this national emergency, when sustained coal production is so essential to our war program. For example, in 1942 one explosion in a mechanized coal mine killed 56 men, all of whom were highly skilled in the operation of mechanical mining equipment or in other occupations incidental to mechanical mining. This represents a material loss to the mining company, as replacement men must be trained and considerable tonnage will be lost until the replacement men become as proficient as those killed. Also, the hiring of new employees reduces the rapidly decreasing mine-labor supply, the scarcity of which has reached the acute stage.

More than 1,256 men were killed in the coal-mining industry in 1941. Based on a closely estimated average production of 1,037 tons of coal per year from each man, this loss of manpower represents an annual loss of coal production of about 1,300,000 tons from fatalities alone, to say nothing of the production lost because of nonfatal disabling injuries and the destruct of property and delay of operations caused by mine accidents.

It is known definitely that the inspection procedure instituted by the Bureau of Mines already is exerting a decided influence toward the reductio of accidents. Certain factors created by the war, however, have a strong tendency to increase accident frequency and severity rates. These factors

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TABLE 5 - Service of Coal-Mine Inspection Division at mine explosions and fires, fiscal year 1942

Date	Company and mine	Location	Nature and probable cause	Number of men				Inspectors participating
				Killed	Injured	Rescued	Escaped	
1/27/42	Wadge mine, Victor American Fuel Co.	Mount Harris, Colo.	Gas explosion of electrical origin.	34	-	-	4	Edward Morgan E. L. Christensen
5/12/42	Peerless mine, Peerless Coal Co.	Excelsior, Ark.	Gas explosion of electrical origin or smoking.	6	1	1	14	James Westfield, Jr.
5/12/42	No. 3 mine, Christopher Coal Co.	Osage, W. Va.	Gas and dust explosion of electrical origin.	56	-	-	8	F E Griffith R W Stahl A. K. Bloom A. J. Barry W. E. Stinnette H. H. Kazee J. R. Dukes W. W. Kessler
5/18/42	Hitchman mine, Hitchman Coal & Coke Co.	Benwood, W. Va.	Coal-dust explosion of electrical origin.	5	-	-	163	F. E. Griffith O. V. Simpson K. N. Maize J. J. Plasky
12/11/41	Powhatan mine, Powhatan Mining Co.	Powhatan Point Ohio	Mine fire, probably of electrical origin.	2	-	-	-	F. E. Griffith H. R. Burdelsky James Westfield, Jr O. V. Simpson J. J. Plasky V. D. Null

include the replacement of experienced and skilled mine workers, who have entered the service of the armed forces or who have left the mines for positions in other defense industries, with unskilled and older workers, accompanied by the speeding up of operations to pace the wartime demand for coal. The increasing mechanization of mines, with its associated electrical and mechanical hazards, presents another factor that, unless carefully considered, may assist the upward trend of accident rates.

There are definite indications that the Federal inspection of mines is effecting considerable improvement in conditions and practices at mines. Numerous instances have been reported by inspectors in which the mine management has issued immediate orders for the correction of unsafe conditions and practices called to its attention by Federal inspectors.

The cooperation of the officials and inspectors of the various State inspection departments has been excellent. Many State mine inspectors have insisted that the State mining laws be complied with, whenever Federal inspection reports have indicated violations, and some State inspectors are exerting influence on the operators to get them to comply with Bureau of Mines recommendations even though these recommendations are more stringent than the State mining law. Several times during the year when immediately dangerous serious explosion and flood hazards were d discovered by Federal inspectors, the mines or parts of mines concerned were closed temporarily on orders from State mining departments or voluntarily by mining companies. In many instances the support and backing of a Federal inspector have aided the State inspector in obtaining improvements in mines that were essential to the health and safety of employees.

There are indications that some mine operators are correcting hazardous conditions at mines in anticipation of Federal inspections; moreover, there is widespread interest among operators as to what the Bureau of Mines considers standard safe practices and conditions. Most of the operators appear to be genuinely grateful for suggestions made by the Federal inspectors both orally and in the reports, and there is evidence that many of them desire to cooperate by correcting hazardous conditions called to their attention. The widespread correction of substandard conditions and practices should result eventually in lowered accident rates in the industry, despite the forces that are tending to increase accidents.

LETTERS OF COMMENDATION

Many letters of commendation of the activities of the Coal-Mine Inspection Division have been received during recent months. These communications from operators, mine workers' organizations, and State inspection departments indicate that recommendations of the inspectors for improving safety conditions in the mines are being given consideration. A few excerpts from such letters follow:

I extend my thanks and appreciation for yours of April 23, together with a copy of a report covering the inspection by Federal Coal Mine Inspectors of the ___ mine of the ____ Company. Of course I shall appreciate copies of all reports rendered by your inspectors in connection with coal mines in this district.

I feel it my duty to mention that one of your inspectors, Mr. ___ ____, favored us with a very interesting, instructive, and helpful talk at our safety meeting ______, I attended this meeting and was very much impressed with the earnestness of Mr. _____, and feel sure that a great deal of good has been done by his visit ____ which I assure you was highly appreciated by the whole operating staff.

We were very much pleased with the preliminary report given by your inspectors here last week and we anticipate the final report with a great deal of interest. I sincerely trust we will be able to avail ourselves of all benefits possible through your department.

I am looking forward to the next meeting of the Advisory Committee, and in the meantime have kept my ear to the ground to get the reaction in the various districts in which we operate. I know you will be pleased to have me say that thus far I have not had any adverse criticism on the activities of the Federal inspection or its personnel.

It is evident that Mr._____ has done an unusually thorough job and we are carefully reviewing the many suggestions and recommendations he has made. These have been referred directly to the mine operating forces._____ We also want to let you know how greatly we appreciate the courteous manner in which Mr. ______ conducted his inspection, and for the many helpful suggestions made by him.

We feel you should know that we were glad of the opportunity to have an inspection and appreciated the fine manner in which inspector _____ conducted his inspection of conditions and practices at our_____ mine. ______

______We are all learning the real meaning of cooperation and, through the fine working together of your departments and the coal operators, feel we can accomplish a great deal of good for our industry.

Many of the recommendations indicate our men have been careless, and we will certainly do our best to correct the matters complained of. I appreciate the thoroughness with which your examiners have covered the situation and this ought really to be very helpful to us.

I assure you it is my desire to have a safe mine, but some of the recommendations will be a little difficult to comply with. I am taking these matters up with the management at once, with the hope when next your men come, you will have fewer complaints and recommendations.

It is a great help to me to receive these advanced preliminary reports, and I thank you for your cooperation in this.

I have checked up with Mr. ______, superintendent of the mine, and many of the things which you mention in your report have already been taken care of, and the rest of them certainly will be.

I appreciate very much the copies of the report covering inspection of the________ Coal Company. This is a very thorough job and the condition of the mine will be imporved greatly if the recommendations are carried out.

The constructive criticism and suggestions offered by both these gentlemen will prove helpful, I am sure, in maintaining a safer operation.

I have just received a copy of the inspection report covering your Department's inspection of our_____ mine. I have examined this report in a preliminary way, and it seems tp me that your department is to be commended for the clear and understandable way the report is complied, as well as for the completeness with which it covers the subject.

I am pleased to inform you that many of the recommendations have been completed; others are under way. Material and equipment are ordered to provide for permissibility of machinery.

INSPECTION OUTLINE AND TENTATIVE SAFETY STANDARDS

For many years the Bureau of Mines has had a mine-safety inspection report outline in booklet form for use of its engineers in making coal-mine inspections. The outline is designed so that it may be used as a notebook in collecting the data necessary for a report. This outline has been revised to bring it up to date for use of the coal-mine inspectors and has been published in booklet form.6/ For ready reference the tenative coal-mine inspection standards have been included in the new edition of the outline.

Tentative coal-mine inspection standards have been prepared by engineers of the Safety Division as a guide for the Federal inspection of coal mines.7/ These standards are based on technical information

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6/ For Outline Mine Safety Inspection Report for Coal Mines, see Appendix F
7/ For Tentative Coal Mine Inspection Standards see Appendix G.

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obtained during many years of experimental work of the Bureau of Mines and on good safety practices and conditions now existing in some mines. The regulations of the mining laws of the several coal-mining States deemed necessary for the prevention of accidents vary widely. In many respects Bureau of Mines standards exceed the provisions of the various State mining laws, and some may conflict with the laws of certain States. Where there is conflict, the intent is not to advocate non-compliance with State law but to suggest that it may be desirable for the State to reconsider such laws or safety orders. The tentative coal-mine inspection standards were published by the Bureau of Mines in Information Circular 7204 issued in February 1942 and have been reprinted by the National Coal Association for distribution to its members.

STATISTICS

An inspection report of noncompliance items corresponding to the tentative safety standards has been prepared for statistical purposes.[8] On this report, the inspector indicates the items listed in the satndards with which there is compliance or noncompliance. This information will give the Mineral Production and Economics Division of the Economics and Statistics Service a comprehensive picture of safety conditions in mines and the progress that is being made from year to year in improving conditions.

MANUSCRIPTS PREPARED AND PRESENTED AT MEETINGS

Three manuscripts were prepared and presented at meetings during the fiscal year by members of the Coal-Mine Inspection Division as follows: The Federal Coal-Mine Inspection Set-Up, by D. Harrington, chief, Health and Safety Branch, Washington, D. C., Coal Mining Institute of America, Pittsburgh, Pa., December 11-12, 1941; Practical Aspects of the Federal Coal-Mine Inspection System, by J. J.Forbes, chief, Coal-Mine Inspection Division, Mine Inspectors' Institue of America, Lexington, Ky., May 25-27, 1942; and Precautions in Using Electric Cables Underground, by G. F. Newman Associate Coal-Mine Inspector, Mine Inspectors' Institute of America, Lexington, Ky., May 25-27, 1942.

SAFETY MEETINGS ATTENDED AND ADDRESSED

The Bureau of Mines has always maintained contact with organizations such as coal-mining institutes, local chapters and district councils of the Holmes Safety Association, and company safety organizations that have for their purpose the promotion of safety in the coal-mining industry. The

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[8] For form for Inspection Report of Noncompliance Items See Appendix H

Coal-Mine Inspection Division will make possible closer contact with these organizations by the attendance of inspectors at safety meetings whenever they can do so without interfering with their regular duties. Since the establishment of the Coal-Mine Inspection Division 61 safety meetings, with total attendance of 6,206 mine officials and mine workers, have been attend and addressed by inspectors of the Coal-Mine Inspection Division.

SPECIAL INVESTIGATIONS

One of the mining-explosives engineers is conducting a special field investigation at mines in Pennsylvania and West Virginia to determine the methods now employed in mines to prevent the projection of Cardox shells from the boreholes and to devise means by which these shells can be confined to the borehols. This study was incomplete at the close of the fiscal year.

An investigation of the use of trailing cables in caol mines is being conducted with the expectation that some of the hazards in connection with their use can be eliminated. Eventually the findings in connection with this study will be published.

At the request of a mining company following a serious explosion of electrical origin in its mine in northern West Virginia, mining-electrical engineers of the Coal-Mine Inspection Division made a special investigation of all of the electrical equipment in all company mines and rendered a comprehensive report on the conditions found.

A special investigation was made at a mine in Pennsylvania to determine the hazard accompanying the practice of gobbing machine cuttings in the mine. This investigation was conducted by an engineer of the Safety Division and an inspector of the Coal-Mine Inspection Division at the request of the mining company. The result of the investigation was a satisfactory solution of the problem for the mining company.

Whenever inspectors observe mining hazards of a controversial nature, it will be the policy of the Bureau to carry on a follow-up investigatio by engineers from the Safety Division in an effort to get a practical solution for the benefit of the industry.

COST OF OPERATING MOTOR VEHICLES

The Coal-Mine Inspection Division used 78 motor vehicles to facilitat the travel of inspectors and the transportation of equipment to and from min The cost of operating these vehicles is shown in table 6. It will be noted that 266,710 miles were traveled at an average cost of 0.0146 cent a mile,

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or a total operating cost of $3,898.35 for the fiscal year. These costs are exclusive of depreciation. The Coal-Mine Inspection Division is now cooperating with the program of the Department of the Interior to conserve rubber and gasoline by using automobiles only when no other means of transportation is available.

CONCLUSIONS

Except for the mines inspected during December as part of the training program, the actural inspection work authorized by the Coal-Mine Inspection Act has been limited to the 6 months January 1 to June 30, 1942. These coal-mine inspections were carried out with an average of approximately only 50 percent of the inspectors in the field. This reduced complement of men was due to existing personnel vacancies and the time spent by the inspectors in training in Pittsburgh.

Utilization of the full complement of coal-mine inspectors, combined with the training and experience they have gained, leads to the expectation that well over 2,000 coal mines will be inspected during the fiscal year 1943.

Although it is too early to determine definitely the benefits that have been derived from execution of the Coal-Mine Inspection Act, it can be stated that there has been marked improvement in conditions and practices in the coal mines that have been inspected, and the coal-mine operators are interested in further safety improvements for coal mines under their direction.

The expressed willingness of the many coal-mine operators and the various State mining departments to cooperate with the coal-mine inspection personnel, and the interest with which the coal-mine inspection reports and press releases are received indicate that this service will greatly benefit the coal-mining industry in its efforts toward accident prevention throughout the coal mines of the United States and Alaska.

TABLE 6 - Cost of operating Inspection-Division motor vehicles, (all coupes) fiscal year 1942

Station	U.S No.	Cost						Number miles traveled	Average cost per mile 1/
		Gasoline	Oil	Repairs and parts	Tires and tubes	Storage, greasing, cleaning, and misc.	Total Operating cost		
Pittsburgh, Pa.	1	$20.44	$1.10	$ 6 00	-	$ 7.48	$35.02	2,399	$0.0146
Do.	8X	45.09	1.20	-	-	12.50	58.79	4,358	.0135
Do.	9X	13.11	.60	-	-	3.25	16.96	2,449	.0069
Do.	10X	26.82	1,85	-	-	1.50	30.17	1,682	.0179
Do.	11X	10.00	-	-	-	12.00	22.00	1,226	.0180
Do.	12X	17.27	3,24	-	-	3.00	23.51	2,277	.0104
Do.	13X	22.58	.45	-	-	.50	23.53	2,728	.0086
Do.	14X	33.61	4.90	-	-	3.00	41.51	2,425	.0171
Do.	15X	12.07	.70	-	-	21.00	33.77	1,282	.0263
Do.	22X	27.53	3.50	-	-	21.85	52.88	2,556	.0207
Do.	31X	3.20	.15	-	-	-	3.35	248	.0135
Do.	39X	14.46	1.89	-	-	1.25	17.60	2,638	.0067
Do.	32X	3.44	-	-	-	-	3.44	544	.0063
Do.	105	35.77	5.23	-	-	5.00	46.00	3,919	.0118
Do.	109	60.74	3.44	-	-	7.00	71.18	6,783	.0106
Do.	114	39.73	5.15	8.42	-	1.25	54.55	3,410	.0157
Do.	215	25.81	2.19	-	-	2.30	30.30	3,348	.0091
Do.	216	45.73	4.80	-	-	37.00	87.53	3,606	.0243
Do.	217	60.58	10.39	-	-	10.73	81.70	8,589	.0095
Do.	224	69.28	9.11	-	-	9.50	87.89	8,585	.0102
Wilkes-Barre, Pa.	21X	18.50	2.64	-	-	20.95	42.09	1,835	.0229
Do.	22	55.76	6.52	-	-	9.45	71.73	5,834	.0123
Do.	23	34.92	5.44	-	-	6.90	47.26	3,848	.0123
Do.	23X	36.92	2.40	-	-	6.95	46.27	3,865	.0120
Do.	35	38.00	5.22	.35	-	23.24	66.81	3,771	.0177
Do.	38	34,09	3.29	10.25	$2.50	8.50	58.63	2,975	.0197

1/ Exclusive of depreciation.

TABLE 6. Cost of operating inspection-division motor vehicles, (all coupes) fiscal year 1942 (Cont'd.)

Station	U S. No	Cost						Number miles traveled.	Average cost per mile[1]
		Gasoline	Oil	Repairs and parts	Tires and tubes	Storage, greasing, cleaning, and misc.	Total Operating cost		
Wilkes-Barre, Pa	40X	$ 4.94	$ 54	-	-	-	$ 5.48	590	$.0093
Do	56	47.00	3 90	$ 5.45	-	$27.50	83.85	4,941	.0170
Mount.Hope, W Va.	7X	22 75	2.10	-	-	22.42	47.27	1,832	.0258
Do.	16X	17 17	.60	-	-	32 30	50.07	1,590	.0315
Do.	20X	29 89	3.00	-	-	32.00	64.89	3,550	.0183
Do.	26X	7 98	3.02	-	-	21 95	32.95	1,663	.0198
Do.	27X	11.74	2 75	-	-	8.64	23.13	952	.0243
Do	79	26 85	1.50	-	-	37 00	65.35	2,771	.0236
Do	96	32.53	3 77	-	-	43.44	79 74	3,053	.0262
Do	97	37.41	2 70	-	-	3.51	43.62	3,424	.0127
Do	117	39.71	5 35	.83	-	47.48	93.37	3,657	.0256
Do.	208	26 64	.93	-	-	52 55	80.12	2,778	.0289
Do.	226	20 52	3.19	-	-	41.48	65.19	2,249	.0290
Do.	241	27 40	3.50	-	-	2 75	33.65	2,810	.0120
Norton Va.	6X	19 71	3.85	2.00	-	34.75	60.31	2,629	.0229
Do.	17X	41.32	5 70	-	-	14.00	61.02	5,114	.0120
Do	18X	7.88	1 20	-	-	16.00	25.08	961	.0261
Do	19X	24.93	1.50	-	-	25.70	52.13	3,543	.0147
Do	28X	8.98	1 20	-	-	14.00	24.18	990	.0244
Do	38X	6.10	1 54	-	-	9.00	16.64	783	.0213
Do	55	27.49	3 00	-	-	25.25	55.74	3,406	.0164
Do	60X	4.18	1 20	-	-	2.00	7.38	946	.0078
Birmingham, Ala	4X	30.85	4 15	-	-	33.25	68.25	3,649	.0187
Do	5X	43.65	2 42	-	-	27.65	73.72	5,302	.0139

[1] Exclusive of depreciation

TABLE 6. - Cost of operating Inspection-division motor vehicles, (all coupes) fiscal year 1942 (Cont'd.)

Station	U.S No.	Cost						Number miles traveled	Average cost per mile[1]
		Gasoline	Oil	Repairs and parts	Tires and tubes	Storage, greasing, cleaning, and misc.	Total Operating cost		
Birmingham, Ala.	31	$37 21	$2.56	$21 71	$7.01	$27.75	$96.24	4,704	$.0204
Do.	981	30.04	.91	-	-	20.50	51.45	4,322	.0119
Do.	118	54.21	1.89	1 75	-	25.00	82.85	6,085	.0136
Vincennes, Ind	2	56.73	5 47	3.55	-	14.42	80.17	7,576	0105
Do	2X	19.44	75	-	-	10.84	31.03	2,895	.0107
Do.	3X	27 82	4.27	-	-	27 38	59.47	3,438	.0172
Do.	24X	4 74	1.25	-	-	14.60	20.59	1,716	.0119
Do.	29	65 27	7.95	-	-	15.75	88.97	5,443	.0163
Do.	29X	18.13	4.00	-	-	3.40	25.53	2,282	.0111
Do.	33	45 63	8.50	-	-	11.55	65.68	6,856	.0096
Do.	34	35 42	4.25	-	-	3.50	43.17	3,983	.0108
Do.	36X	8 74	1.50	-	-	5 50	15.74	2,178	.0072
Do.	62X	5.89	-	-	-	1.05	6.94	630	.0110
Do	138	55.41	5 27	-	-	13.50	74.18	6,622	.0112
Do	139	53.33	4.09	-	-	18.76	76.18	5,756	.0132
Duluth, Minn.	37X	16.93	1.85	-	-	13.25	32.03	2,440	.0131
McAlester, Okla	25X	9.70	1.77	-	-	3.50	14.97	1,281	.0117
Do	119	32.86	5 51	-	-	17.35	55.72	6,630	.0084
Salt Lake City, Utah	39	15 18	4.80	-	-	33.70	53.68	1,641	.0328
Do.	108	21.04	3.79	-	-	28.65	53.48	1,228	.0435
Do.	232	42 66	3 79	-	-	22.20	66.66	3,854	.0173
Do	273	28.22	2 21	-	5.20	21 40	57.03	3,170	.0180
Denver, Colo.	1X	41 63	3.30	1 32	-	31.93	78.18	6,211	.0126
Do	99	41.58	4 83	.50	-	24.61	71.52	8,311	.0086
Do.	279	41 39	4.43	5 30	-	34.11	85.23	3,943	.0216
Do.	289	2/39 85	2/1.99	10.55	-	26.24	2/78.63	6,299	.0125
College Park, Md	209	2/28.22	2/2.21	-	-	-	30.43	3,214	.0094
Anchorage, Alaska	30X	2/30.85	2/4 14	-	-	-	2/35.00	3,639	.0096
Total		$2,281.19	$243.31	$77.98	$14.71	$1,281.16	$3,898.35	266,710	.0146

1/Exclusive of depreciation.
2/Estimated.

~~9428~~

APPENDIX A

(PUBLIC LAW 49 - 77th CONGRESS)

(CHAPTER 87 - 1st SESSION)

(H. R. 2082)

AN ACT

Relating to certain inspections and investigations in coal mines for the purpose of obtaining information relating to health and safety conditions, accidents, and occupational diseases therein, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior, acting through the United States Bureau of Mines, is hereby authorized and empowered to make or cause to be made annual or necessary inspections and investigations in coal mines the products of which regularly enter commerce or the operations of which substantially affect commerce -

(a) For the purpose of obtaining information relating to health and safety conditions in such mines, the causes of accidents involving bodily injury or loss of life in such mines, or the causes of occupational diseases originating in such mines, whenever such health or safety conditions, accidents, or occupational diseases burden or obstruct commerce or threaten to burden or obstruct commerce.

(b) For the purpose of obtaining information relating to health and safety conditions in such mines, the causes of accidents involving bodily injury or loss of life in such mines, or the causes of occupational diseases originating in such mines, as a basis for determining the most effective manner in which the public funds made available for the protection or advancement of health or safety in coal mines, and for the prevention or relief of accidents or occupational diseases therein may be expended for the accomplishment of such objects.

(c) For the purpose of obtaining information relating to health and safety conditions in such mines, the causes of accidents involving bodily injury or loss of life in such mines, or the causes of occupational diseases, originating in such mines, as a basis for the preparation and dissemination of reports, studies, statistics, and other educational materials pertaining to the protection or advancement of health or safety in coal mines and to the prevention or relief of accidents or occupational diseases in coal mines.

(d) For the purpose of obtaining information relating to accidents involving bodily injury or loss of life in such mines or relating to occupational diseases originating in such mines, to be transmitted to the Bureau of the Census for use in connection with the preparation and compilation of the various Census reports.

(e) For the purpose of obtaining information relating to health and safety conditions in such mines, that causes of accidents involving bodily injury or loss of life in such mines, or the causes of occupational diseases originating in such mines, to be transmitted to the Congress for its consideration in connection with legislative matters involving health and safety conditions, accidents, or occupational diseases in coal mines.

Sec. 2. The Secretary of the Interior, acting through the United States Bureau of Mines, is further authorized and empowered to make or cause to be made the inspections and investigations provided for in section 1 of this Act at other than annual intervals at any time in his discretion when the making of such inspections or investigations in the mine concerned will be in furtherance of the purposes of this Act.

Sec. 3. The Secretary of the Interior acting through the United States Bureau of Mines, or any duly authorized representative of such Bureau, shall be entitled to admission to any coal mine the products of which regularly enter commerce or the operations of which substantially affect commerce, for the purpose of making any inspection or investigation authorized under section 1 or section 2 of this Act.

Sec. 4. Any owner, lessee, agent, manager, superintendent, or other person having control or supervision of any coal mine subject to the provisions of section 1 or section 2 of this Act who refuses to admit the Secretary of the Interior, acting through the United States Bureau of Mines, or any duly authorized representative of such Bureau, to such mine, pursuant to the provisions of section 3 of this Act, shall be guilty of a misdemeanor and, upon conviction thereof, shall be punished by a fine not exceeding $500 or by imprisonment not exceeding sixty days, or by both.

Sec. 5. Every owner, lessee, agent, manager, superintendent, or other person having control or supervision of any coal mine the products of which regularly enter commerce or the operations of which substantially affect commerce shall furnish to the Secretary of the Interior, acting through the United States Bureau of Mines, or to any duly authorized representative of such Bureau, upon request, complete and correct information to the best of his knowledge concerning any or all accidents involving bodily injury or loss of life which occured in such mine during the calendar year in which the request is made or during the preceding calendar year.

Sec. 6. The Secretary of the Interior, acting through the United States Bureau of Mines, is hereby authorized and directed -

(a) To report annually to the Congress, either in summary or detailed form, the information obtained by him under this Act, together with such findings and comments thereon and such recommendations for legislative actions as he may deem proper;

(b) To compile, analyze, and publish, either in summary or detailed form, the information obtained by him under this Act, together with such findings concerning the causes of unhealthy or unsafe conditions, accidents, or occupational diseases in coal mines, and such recommendations for the prevention or amelioration of unhealthy or unsafe conditions, accidents, or occupational diseases in coal mines as he may deem proper;

(c) To prepare and disseminate reports, studies, statistics, and other educational materials pertaining to the protection or advancement of health or safety in coal mines and to the prevention or relief of accidents or occupational diseases in coal mines;

(d) To expend the funds made available to him for the protection or advancement of health or safety in coal mines, and for the prevention or relief of accidents or occupational diseases therein, in such lawful manner as he may deem most effective in the light of the information obtained under this Act to promote the accomplishment of the objects for which such funds are granted;

(e) To transmit to the Director of the Census, either in summary or detailed form, the information obtained by him under this Act, for use in connection with the preparation and compilation of the various Census reports; and

(f) To make available for public inspection, either in summary or detailed form, the information obtained under this Act, as soon as practicable after the acquisition of such information.

Sec. 7. The execution of the provisions of this Act shall devolve upon the United States Bureau of Mines and the Secretary of the Interior may designate other bureaus or offices in the Department of the Interior to cooperate with the United States Bureau of Mines for such purpose. In order to promote sound and effective coordination of Federal and local activities within the field covered by this Act, the Secretary of the Interior, and the several bureaus and offices under his jurisdiction, shall cooperate with the official mine inspection or safety agencies of the several States and Territories, and, with the consent of the proper authorities thereof, may utilize the services of such agencies in connection with the administration of this Act. Copies of all findings, recommendations, reports, studies, statistics and information made public under the authority of clauses (b), (c), and (f) of section 6 of this Act shall, whenever practicable, be furnished any cooperating State or Territorial agency which may request the same.

Sec. 8. The Secretary of the Interior, acting through the United States Bureau of Mines, may, in his discretion, create and establish an advisory committee composed of not more than six members to exercise consultative functions, when required by the Secretary, in connection with the administration of this Act. The said committee shall be composed of representatives of coal-mine owners and of representatives of coal-mine workers in equal number. The members of said committee shall be appointed by the Secretary of the Interior without regard to the civil-service laws.

Sec. 9. The Secretary of the Interior, acting through the United States Bureau of Mines, shall have authority to appoint, subject to the civil-service laws, such officers and employees as he may deem requisite for the administration of this Act; to fix, subject to the Classification Act of 1923, as amended, the compensation of officers and employees so appointed; and to prescribe the powers, duties, and responsibilities of all officers and employees engaged in the administration of this Act: Provided, however, That in the selection of persons for appointment as coal-mine inspectors no person shall be so selected unless he has the basic qualification of at least five years' practical experience in the mining of coal, and is recognized by the United States Bureau of Mines as having the training or experience of a practical mining engineer in those essentials necessary for competent coal-mine inspection; and in detailing coal-mine inspectors to the inspection and investigation of individual mines, due consideration shall be given to their previous practical experience in the work of mining coal in the State, district, or region where such inspections are to be made.

Sec. 10. There are hereby authorized to be appropriated, out of any moneys in the Treasury not otherwise appropriated, such sums as may be necessary for the due execution of this Act.

Sec. 11. For the purposes of this Act, the term "commerce" means trade, traffic, commerce, transportation, or communications between any State, Territory, possession, or the District of Columbia and any other State, Territory, or possession, of the United States, or between any State, Territory, possession, or the District of Columbia and any foreign country, or wholly within any Territory, possession, or the District of Columbia, or between points in the same State if passing through any other State or through any Territory, possession, or the District of Columbia or through any foreign country.

Sec. 12. If any provision of this Act, or the application thereof to any person or circumstance, is held invalid, the remainder of this Act, and the application of such provision to other persons or circumstances, shall not be affected thereby.

Approved, May 7, 1941.

APPENDIX B

Bureau of Mines Amendment to the Department of the Interior Appropriation Bill, fiscal year 1942 (H.R. 4590)

Coal-mine inspections and investigations: For all expenses necessary to enable the Bureau of Mines to perform the duties imposed upon it by the Act of May 7, 1941 (Public No. 49); including supplies and equipment; traveling expenses; not to exceed $62,500 for personal services in the District of Columbia; not to exceed $25,000 for printing and binding; purchase in the District of Columbia and elsewhere of furniture and equipment, stationery and supplies, typewriting, adding, computing and addressing machines, and other labor-saving devices, accessories and repairs, including exchange and maintenance thereof; professional and scientific books and publications; not to exceed $78,000 for the purchase (including exchange as part payment), operation, maintenance and repair of motor-propelled trucks and passenger-carrying vehicles for official use in field work and in transporting employees between their homes and temporary locations where they may be employed; purchase of special wearing apparel or equipment for the protection of employees while engaged in their work; travel and subsistence, and other incidental expenses of employees in attendance at meetings and confere for promoting safety and health in the coal mining industry without the limitation in Sec. 6 of this Act, $729,000: Provided, that the Secretary of the Interior, acting through the Director of the Bureau of Mines, is hereby authorized to accept buildings, equipment, and other contributions from public or private sources offering to cooperate in carrying out the purposes of this appropriation.

$729,000.

Justification

Coal Mine Inspections and Investigations, Bureau of Mines

1	Inspection service (field) (9 mos.)	$498,935
2.	Investigations on electricity and explosives in coal mines (field) (9 mos.)	44,160
3.	Occupational disease investigations (field) (9 mos.)	24,650
4	Mine inspection division headquarters (Washington, D. C.) (12 mos.)	24,110
5.	Information unit (Washington, D. C.) (9 mos.)	26,885
6.	Gas and dust laboratory analytical work (Pittsburgh, Pa.) (9 mos.)	29,445
7.	Testing of electrical machinery (Pittsburgh, Pa.) (12 mos.)	8,420
8.	Coal analysis work (Pittsburgh, Pa.) (9 mos.)	12,765
9.	Coal mine accident statistics (Washington, D. C.) (12 mos.)	20,000

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Justification

10. Additional work in the Administrative Branch (Washington, D. C.) (12 mos.)	14,630
11. Printing, binding, etc	25,000
Total estimate of appropriation for 1942	$729,000

The purpose of this appropriation is to provide funds to carry into effect the provisions of the Coal Mine Inspection Act (Public No. 49), approved May 7, 1941, "relating to certain inspections and investigations in coal mines for the purpose of obtaining information relating to health and safety conditions, accidents, and occupational diseases therein, and for other purposes."

Coal Mine Inspections and Investigations, Bureau of Mines

1. Inspection service (field) $498,935

The Coal Mine Inspection Act, approved May 7, 1941, provides "that the Secretary of the Interior, acting through the United States Bureau of Mines, is hereby authorized and empowered to make or cause to be made annual or necessary inspections and investigations in coal mines" and "is further authorized and empowed to make or cause to be made - - - - - - inspections - - - - - at other than annual intervals at any time in his discretion when the making of such inspections or investigations in the mine concerned will be in the furtherance of this act." Also "the Secretary of the Interior, acting through the United States Bureau of Mines is - - - - authorized and directed - - - - to make available for public inspection, either in summary or detailed form, the information obtained uuder this act, as soon as practicable after the acquisition of such information."

There are between 6,000 and 7,000 normally producing coal mines in the United States and about an equal number of other mines which produce coal during certain parts of the year,. These 6,000 to 7,000 normally operating mines are located in 25 States and Alaska, with 6 other States having coal mining to a less extent. It is proposed at this time to give immediate attention to the approximately 2,500 mines employing more than 25 persons each and in this to utilize the services of 107 inspectors; this number is known to be inadequate to cover all of the coal mines of the United States and there is every likelihood that later on the number should be increased to at least 250 or even more. The spreading of mine mechanization now getting well started increased the operating hazards in many ways, one of importance being that it increases the number of shifts of work from the normal one shift per day in hand loading to the 2- or 3- shift operation of mechanized mines. This, together with the fact that 107 inspectors manifestly cannot inspect the total of 14,000 or more coal mines large and small, may make it necessary to very materially increase the suggested force of 107 inspectors later on.

The inspectors will be placed under the direction of the supervisors of now established districts of the Safety Division and it is proposed to distribute the 107 inspectors as well as 14 stenographer-clerks at suitable places (usually the offices of the Safety Division) located in or close to the coal-mining regions of the United States. The 14 stenographer-clerks will have as their chief occupation the writing of the reports made by the inspectors; obviously the allotment of one clerk to about eight inspectors is placing a heavy burden on the clerks and it may be necessary later to increase the number of clerks.

The allotment requested for this service (all to be expended in the field) is as follows:

15 Senior inspectors, P-5, to act as assistants to the chief inspector and the district engineers, at $4,600 (9 mos.)	$51,750		
33 Inspectors, P-4, at $3,800 (9 mos.)	94,050		
33 Associate inspectors, P-3, at $3,200 (9 mos.)	79,200		
26 Assistant inspectors, P-2, at $2,600 (9 mos.)	50,700		
7 Junior Clerk-Stenographers, at $1440 (9 mos.) CAF-2	7,560		
7 Assistant Clerk-Stenographers, at $1620 (9 mos.) CAF-3	8,405		
Total personnel (recurring) (9 mos.)		$291,665	
Travel (recurring)		74,900	
Supplies, contracts, etc. (recurring)		33,470	
Total (recurring)		$400,035	
Equipment (furniture, automobiles, typewriters, anemometers, etc.) (non-recurring)		98.900	
Total			$498,935

Coal Mine Inspections and Investigations, Bureau of Mines

2. Investigations on electricity and explosives in coal mines (field) $44,160

The rapid progress in the mechanizing of coal mines has introduced numerous new hazards of various kinds and this is particularly true as to the use of electricity and explosives. In the past few years virtually all

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of the very bad major mine explosion disasters have been initiated by electricity or by explosives. Of 6 major coal mine disasters in 1940, with 276 fatalities, 5 occurred in highly mechanized mines; 5, with 204 fatalities, were caused by electricity and one, with 72 fatalities, was caused by use of explosives; moreover 2 rather serious mine explosions in the early part of 1941 were caused by electric arcs. In 1937, 1938, 1939, and 1940, four of the most destructive coal mine disasters in the United States occurred in mechanized mines due to use of explosives, the total loss of life in these disasters being 184. In addition to causing mine explosion disasters, both explosives and electricity cause numerous other accidents both fatal and nonfatal in the coal mines of the United States and there is a definite field for intensive investigations as to matters pertaining to both explosives and electricity in mining to try to reduce the very definite hazards now existing and to try to prevent their becoming much greater as the coal mines of the United States become more intensely mechanized.

It is proposed to employ five engineers well informed in the application of electricity to mine operations and also five engineers well informed in the utilization of explosives in coal mining, these men to be attached to the field offices of the Safety Division of the Bureau of Mines and to make investigations on safety connected with the application of electricity and explosives to coal mining and to give aid and advice on these matters to the mine inspection forces. Clerical aid for these electrical and explosives experts will be supplied from the clerical force in the Safety Division offices, as provided under the allotments for the 107 inspectors.

The allotment requested for investigations on electricity and explosives in coal mines is as follows:

5 engineers with experience in electricity in mining, P-4, at $3,800 (9 mos.)	$14,250		
5 engineers with experience in explosives in mining P-4, at $3,800 (9 mos.)	14,250		
Total personnel (recurring) (9 mos.)		$28,500	
Travel (recurring)		7,500	
Supplies and equipment (recurring)		5,160	
Total (recurring)			$41,160
Supplies and equipment (non-recurring)			3,000
Total			$44,160

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Justification

Coal Mine Inspections and Investigations, Bureau of Mines

3. Occupational Disease investigations (field and laboratory) $24,650

The coal-mine worker is subjected to exceptionally strenuous activities and his working environment is frequently of such nature as to be detrimental to health due to atmospheric conditions, including dusts, gases, temperatures, and humidities, as well as methods of work, effect of handling various devices, equipment, working under deficient lighting, etc. Moreover, there is good reason to believe that conditions adversely affecting health contribute materially to accident occurrence and it is very desirable to ascertain the physiological effect of atmospheric and other conditions so as to be able to make suitable suggestions to bring about remedial action. For this purpose it is desired to employ 2 physicians, 2 associate mining engineers, and 1 assistant chemist, together with 1 clerk-stenographer, these employees to be assigned to headquarters at Pittsburgh, Pennsylvania, and at other points in the field in such manner that this type of work will be done essentially simultaneously in anthracite mining and in bituminous coal mining west of the Mississippi River, as well as east of it.

The allotment requested for this work is as follows:

1 physician, P-5 at $4,600 (9 mos.)	$3,450		
1 physician, P-4, at $3,800 (9 mos.)	2,850		
2 associate mining engineers, P-3, at $3,200 (9 mos.)	4,800		
1 assistant chemist, P-2, at $2,600 (9 mos.)	1,950		
1 clerk-stenographer, CAF-4, at $1,800 (9 mos.)	1,350		
Total personnel (recurring) (9 mos.)		$14,400	
Travel (recurring)		3,000	
Supplies and equipment (recurring)		2,000	
Total (recurring)			$19,400
Supplies and equipment (non-recurring)			5,250
Total			$24,650

Coal Mine Inspections and Investigations, Bureau of Mines

4. Mine Inspection Division Headquarters (Washington, D. C.) $24,110

The Mine Inspection Division will be in the Health and Safety Branch of the Bureau of Mines and will be invested with a grave responsibility. Since it will not have regulatory or police powers its functions will be almost

Justification

wholly investigative, recommendatory and above all educational, and there will be a vast volume of technical reports and other work to be handled and correlated. Manifestly the work should be in charge of a competent engineer with an extended knowledge of coal mining and of administrative work and it is proposed that he be of P-6 Grade.

The work of the Health and Safety Branch in Washington, D. C., will be greatly increased due to the large amount of correspondence, etc., as well as the handling of a great amount of technical reports and other activities of the approximately 250 persons in the new Mine Inspection Division. It is proposed to add to the Washington office of the Health and Safety Branch, 1 administrative assistant, 1 mining engineer, 1 secretarial clerk, and 3 assistant clerk-stenographers.

The allotment requested for this purpose would be expended in the District of Columbia as follows:

1 Chief of the Mine Inspection Division, P-6, at $5,600	$5,600		
1 Assistant to chief inspector, P-4 at $3,800	3,800		
1 Technical Assistant (Mining Engineer), P-5, at $4,600	4,600		
1 Secretarial Clerk, CAF-4, at $1,800	1,800		
3 Assistant Clerk-Stenographers, CAF-3, at $1,620	4,860		
Total personnel (recurring)		$20,660	
Travel (recurring)		2,000	
Supplies and equipment (recurring)		200	
Total (recurring)			$22,860
Supplies and equipment (non-recurring)			1,250
Total			$24,110

Coal Mine Inspections and Investigations

5. Information Unit (Washington, D. C.) $26,885

The mine inspection act contains numerous provisions requiring the dissemination of information on conditions disclosed by the investigations authorized. The first section of the bill provides that the Secretary of the Interior is authorized to make inspections for the purpose of obtaining information "as a basis for the preparation and dissemination of reports,

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studies, statistics, and other educational materials." This direction is repeated in Section 6, paragraph (b), which states that the Secretary of the Interior is authorized and directed "to compile, analyze, and publish" the information obtained by him under the Act. Section 6, paragraph (c), states that he is authorized and directed "to prepare and disseminate reports, studies, statistics, and other educational materials pertaining to the protection or advancement of health or safety in coal mines and to the prevention or relief of accidents or occupational diseases in coal mines." Section 6, paragraph (f), states that the Secretary of the Interior is likewise directed "to make available for public inspection, either in summary or detailed form, the information obtained under this Act, as soon as practicable after the acquisition of such information."

The intent of the Congress is spelled out in detail in these and other paragraphs. There is no authorization given to the Secretary of the Interior to enforce recommendations or to impose sanctions other than those generated by public opinion. Legislative history and language establishes that it is the intent of the Congress that the adequate publication and dissemination of the information disclosed by investigations and inspections would of itself act as a moral force on operators of mining properties where deficient conditions are disclosed.

It is proposed, therefore, that the Information Unit prepare and disseminate, both in summary and detailed form, information material based upon the inspection reports. In some instances this material will consist of summaries of the reports. In many instances involving small mining properties employing only two or three persons, a number of the reports will be condensed and dealt with in single statements. In other instances involving large properties presenting multiplicity of detail, it will be necessary to prepare rather long and detailed statements. Such announcements will be distributed, according to demand, to newspapers, trade journals, mine operators, miners' organizations, union publications, health and safety groups or organizations, insurance associations, State Departments, compensation commissions and similar agencies or organizations which request them.

In addition to preparing such summaries of the reports, the Information Unit, acting under the general direction of the Editor of Current Information of the Bureau of Mines, will prepare press releases and similar announcements dealing with the general progress, organization, and problems of the inspection program, including the findings of the Bureau on problems directly related to the mine inspection work. Such public announcements will be issued from time to time as they are felt to be desirable, and will inform the public of the work accomplished under the Act, setting forth the policies followed by the Bureau in carrying out the orders of the Congress.

At the present time the Bureau is not equipped to perform these services. It is anticipated that the program ultimately will require the inspection of 6,000 to 7,000 coal mines and that the work eventually will generate approximately 100 inspection reports weekly. Many of these reports will be replete with detail. At the present time the Bureau has only one person (Editor of Current Information) who prepares press releases, public announcements, newspaper articles, and similar material. It is obvious that, in addition to his present duties, he could not by himself prepare summaries and announcements covering a large number of inspection reports weekly.

The allotment requested for the Information Unit is as follows:

1 Chief of Section (P-5), at $4,600 (9 mos.)	$3,450		
1 Information Specialist at $3,800 (CAF-11) (9 mos.)	2,850		
1 Associate Information Specialist at $3,200 (CAF-9) (9 mos.)	2,400		
1 Clerk (CAF-4) at $1,800 (9 mos.)	1,350		
3 Asst. Clerk-Stenographers at $1,620 (CAF-3) (9 mos.)	3,645		
2 Under Operator of Office Devices (Mimeograph) at $1,260 (9 mos.)	1,890		
Total Personnel (recurring) (9 mos.)		$15,585	
Supplies and Equipment (recurring)		10,000	
Total (recurring)		$25,585	
Supplies and Equipment (non-recurring)		1,300	
Total			$26,885

Coal Mine Inspections and Investigations, Bureau of Mines

6. Gas and Dust Laboratory Analytical Work (Pittsburgh, Pa.) $29,445

The inspection work done by the Mine Inspection Division will involve the analyzing of at least 14,000 mine gas samples and of determining the number of particles and their composition in connection with about 10,500 air-dust samples per annum. This work will be done to ascertain the

Justification

quality of mine air as to explosibility, asphyxiation, and the general respiratory harmfulness both as to gases and dusts. This analytical work is of extreme importance in obtaining definite information as to the hazard of mine workings both as to safety and as to health conditions since data on mine air explosibility is of paramount importance in trying to avoid mine disasters as well as the burning and maiming of individuals. This activity entails a vast amount of laboratory work as it cannot be done in the field and inasmuch as the Health Division of the Health and Safety Branch is set up to do this work at Pittsburgh, Pa., it is proposed to locate this activity and personnel at the Pittsburgh Experimental Station.

The allotment requested for gas and dust laboratory analytical work to be done at Pittsburgh, Pa., is as follows:

1 General Supervisor and Chemist at $3,800 (P-4) (9 mos.)	$2,850		
4 Junior Chemists at $2,000 (P-1) (9 mos.)	6,000		
1 Associate Physicist at $3,200 (P-3) (9 mos.)	2,400		
1 Asst. Chemical Petrographer at $2,600 (P-2) (9 mos.)	1,950		
1 Scientific Aides at $1,800 (SP-5) (9 mos.)	2,700		
1 Asst. Scientific Aide at $1,620 (9 mos.)	1,215		
1 Junior Laboratory Helper at $1,440 (SP-3) (9 mos.)	1,080		
1 Junior Stenographer at $1,440 (CAF-2) (9 mos.)	1,080		
2 Junior Typists at $1,260 (CAF-1) (9 mos.)	1,890		
Total personnel (recurring) (9 mos.)		$21,165	
Laboratory and Office Supplies (recurring)		2,380	
Total (recurring)			$23,545
Laboratory and Office Supplies and Equipment (non-recurring)			5,900
Total			$29,445

Coal Mine Inspections and Investigations, Bureau of Mines

7.-Testing of Electrical Machinery (Pittsburgh, Pa.) $8,420

The rapid extension of mechanized coal mining now well under way and likely to become almost universal in the larger coal mines of the United

Original from THE OHIO STATE UNIVERSITY

Justification

States, with practically all of the machinery operated electrically, is very greatly increasing the hazard of the industry not only in connection with fires and explosions caused by electricity, but also with regard to contact injuries, many of which are fatal. Five of the 6 major coal mine disasters of 1940 were caused by ignitions of explosive gas by electric arcs and the 3 fairly serious underground coal mine explosions of 1941 were also caused by electric arcs. If all installations of underground electrical equipment were of permissible types approved by the Bureau of Mines and the permissibility were maintained by keeping the equipment in suitable repair, practically all of these explosions (as well as numerous fires of electrical origin) would be avoided. The Bureau of Mines inspection force will try to bring about the universal use of permissible equipment in the coal mine of the United States and there is very good reason for the belief that the pressure thus brought on the coal mining industry will quickly result in a greatly increased demand for testing of equipment by the Bureau of Mines electrical testing laboratory at Pittsburgh, Pa.

The allotment requested would be expended chiefly in the Central Experiment Station of the Bureau of Mines at Pittsburgh, Pa., as follows:

1 Associate Electrical Engineer (P-3) at $3,200	$3,200		
1 Junior Electrical Engineer (P-1) at $2,000	2,000		
1 Asst. Clerk-Stenographer (CAF-3) at $1,620	1,620		
Total Personnel (recurring)		$6,820	
Travel (recurring)		200	
Supplies (recurring)		1,400	
Total (recurring)			$8,420

Coal Mine Inspections and Investigations, Bureau of Mines

8. Coal Analysis Work (Pittsburgh, Pa.) $12,765

Practically all widespread coal mine explosions in bituminous mines result from participation of coal dust in the explosion and if this hazard can be overcome at least 90 percent of the danger from mine disasters will be removed. It is now definitely known that if rock-dusting is done effectively in coal mines, the coal dust explosion menace is practically eliminated but it is by no means an easy matter to know whether the rock-dusting has been done well or whether the existing rock dust-coal mixture is or is not of such nature as to be susceptible of ignition and of participating in an explosion.

Justification

To make certain as to this, the mine inspector has only one dependable method, namely sampling of the dust on the mine surfaces and having the explosibility determined by analysis and other tests in the laboratory. It is expected that 10,000 to 12,000 samples per year will be submitted for analysis and while the Central Experiment Station has facilities to do this work now those facilities both as to equipment and personnel are utterly inadequate to handle the large number of samples to be submitted by the mine inspection force for analysis and test. The allotment requested for this purpose will be expended at the Central Experiment Station, Pittsburgh, Pa., and it is as follows:

1 Chemist at $3,800 (P-4) (9 mos.)	$2,850		
2 Jr. Chemists at $2,000 (P-1) (9 mos.)	3,000		
2 Scientific Aides at $1,800 (Sp-5) (9 mos.)	2,700		
1 Asst. Clerk-Stenographer at $1,620 (CAF-3) (9 mos.)	1,215		
Total Personnel (recurring) (9 mos.)		$9,765	
Laboratory Supplies and Equipment (recurring)		3,000	
Total (recurring)			$12,765

Coal Mine Inspections and Investigations, Bureau of Mines

9. Coal Mine Accident Statistics $20,000

Among the duties assigned to the Bureau of Mines by the Mine Inspection Law is the following:

Sec. 6c - "To prepare and disseminate reports, studies, statistics, and other educational materials pertaining to the protection or advancement of health and safety in coal mines and to the prevention or relief of accidents or occupational diseases in coal mines."

While procedures can be formulated by which the accident occurence data from the individual mines or mining States can be obtained from the field the correlation of this information and prompt release of it at least monthly for the benefit of the inspectors as well as the mining public are very essential to the proper appreciation of what is the actual accident occurence at any time. The Employment Statistics Section of the Bureau of Mines at Washington, D. C., is doing some of this work now but it is inadequately equipped with personnel and facilities to give promptly the type of current statistical information that is urgently needed if the Federal

Justification

mine inspectors are to be kept adequately informed as to what is happening both as to nonfatal and as to fatal accidents. Current information as to nonfatal accidents is not furnished at all at present and information as to fatal accidents is very greatly delayed, due chiefly to lack of personnel to correlate the available data.

The allotment requested for this work would be expended in Washington, D. C., partly in the Employment Statistics Section of the Bureau of Mines but with 1 employee, $1,440 per year, and the rental of 2 calculating machines, $3,360 per year in the Miscellaneous Service Division of the Department of the Interior, the employees and the machines to be used by the Employment Statistics Section of the Bureau of Mines in trying to get out its current statistical material with as little delay as possible. The proposed allotment is as follows:

1 Associate Mining Engineer (P-3)	$3,200		
1 Asst. Statisticician (P-2)..........	2,600		
1 Clerk (CAF-4).........................	1,800		
1 Asst. Clerk (CAF-3)................	1,620		
2 Stenographer Clerks at $1620 (CAF-3)..............................	3,240		
1 Junior operator of office devices (CAF-2) for Electrical Tabulating and Collating Machines (recurring)	1,440		
Total Personnel (recurring)		$13,540	
Travel (recurring)......................	600		
Supplies and equipment (recurring)	400		
Rental of one electrical tabulating machine (recurring)	2,400		
Rental of one electrical collating machine (recurring)...............	930		
Supplies Total (recurring)		4,330	
Supplies and equipment (non-recurring)		2,100	
Total..			$20,000

Coal Mine Inspections and Investigations, Bureau of Mines

10. Additional Work in the Administrative Branch, Washington, D. C. $14,630

The Coal Mine Inspection Act will add to the personnel of the Bureau of Mines approximately 189 employees, at least 2/3 of whom will be in travel status, thereby adding materially to the administrative work of the Washington Office of the Bureau of Mines particularly to those sections

Justification

having the fiscal activities in charge, such as auditing and bookkeeping, and also the personnel, property, and filing sections. Funds should also be provided for telegrams, purchase of typewriters and other labor saving devices, and for freight and express.

It is estimated that the following amounts will be required:

1 Senior Clerk-Auditor, CAF-5	$2,000		
1 Clerk-Auditor, CAF-4, at $1,800	1,800		
1 Bookkeeping Machine Operator, CAF-3	1,620		
3 Jr. Clerk-Stenographers, CAF-2, at $1,440	4,320		
1 Jr. Clerk, CAF-2	1,440		
Total Personnel (recurring)		$11,180	
Telegrams (recurring)		1,000	
Freight and express (recurring)		1,200	
Total recurring			$13,380
Equipment (non-recurring)			1,250
Total			$14,630

Coal Mine Inspections and Investigations, Bureau of Mines

11. Printing, Binding, Etc. $25,000

The intent of the Mine Inspection Act is that compulsion will be used only for entrance into properties to obtain information and that the main, ultimate purpose of the act, namely, the reduction of accidents in the coal mines of the United States, will be attained by educational methods and while several sections of the act state or imply this purpose, Section 6b specifically states that the "Secretary of the Interior, acting through the Bureau of Mines is authorized and directed to compile, analyze and publish either in summary or detailed form, the information obtained by him under this act"…….and in Section 6c he is authorized and directed through the Bureau of Mines, "To prepare and disseminate reports, studies, statistics, and other educational materials"…… To carry out these as well as other provisions of the act requiring the performance of educational work among the approximately 600,000 workers in the coal mines of the United States, it is almost absolutely necessary to have a considerable amount of printed published material such as Accident and Disaster Reports, Miners' Circulars, Safety Hints or Instructions, etc,, in such form and number that they can be issued to the public but more particularly so they can be placed in the hands of as many as possible of the 600,000 coal-mine workers to keep them informed individually on matters pertaining to safety in coal mining.

Justification

To aid in trying to accomplish the purposes of this act it is requested that an allotment of $25,000 be made for printing and binding (recurring).

APPENDIX C

UNITED STATES CIVIL SERVICE EXAMINATIONS

No. 106
(Unassembled)

SENIOR COAL MINE INSPECTOR, $4,600 A YEAR
COAL MINE INSPECTOR, $3,800 A YEAR
ASSOCIATE COAL MINE INSPECTOR, $3,200 A YEAR
ASSISTANT COAL MINE INSPECTOR, $2,600 A YEAR

Bureau of Mines, Department of the Interior

Applications will be rated as received at the United States Civil Service Commission, Washington, D. C., until December 31, 1941, and certification made as the needs of the service require, except that if sufficient eligibles are obtained, the receipt of applications may be closed before the date specified, in which case due notice will be given.

A subsequent application will not be accepted from any applicant within 3 months of the date of receipt of his preceding application under this announcement.

When an applicant who has been rated eligible in the examination for any of the grades listed above files a subsequent application, but is found ineligible for a higher grade than that for which he has been rated, his application will be canceled and no additional rating will be assigned him in the grades for which he is already eligible.

The United States Civil Service Commission announces open competitive examinations for the positions named above. Vacancies in these positions in the Bureau of Mines at various points in the United States and vacancies in positions requiring similar qualifications will be filled from these examinations, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion. The salaries named above are subject to a deduction of 3½ percent toward a retirement annuity.

Duties.—To make inspections and investigations in and around coal mines for the purpose of obtaining information relating to health and safety conditions, the causes of accidents involving bodily injury or loss of life, and the causes of occupational diseases in such mines; and to prepare reports on the inspections and investigations made, and to disseminate information with a view to helping reduce accidents and ill health in connection with coal mining.

Basis of ratings.—Competitors will not be required to report for examination at any place, but will be rated on the extent of their education, on the extent and quality of their experience relevant to the duties of the position applied for, and on their fitness, on a scale of 100, such ratings being based upon competitors' sworn statements in their applications and upon corroborative evidence.

Statements concerning qualifications will be verified by the Commission; exaggeration or misstatement will be cause for disqualification.

APPLICANTS MUST POSSESS THE FOLLOWING QUALIFICATIONS

1. They must be citizens of the United States on the date of receipt of application. Foreign-born applicants who meet the citizenship requirement must furnish proof of United States citizenship before they will be eligible for appointment under civil-service rules.
2. **Experience.**—Except for the substitution provided for below, applicants must show, as a minimum, experience as follows:

Senior Coal Mine Inspector.—Ten years of broad and progressive practical experience in connection with safety-of-operation of *coal* mines in the United States, including at least 4 years of very difficult, important, and responsible specialized work in some supervisory capacity (such as mine superintendent, general superintendent, mining engineer, or safety engineer). This experience must have affirmatively demonstrated a thorough knowledge of the principles of mine safety work and their application; resourcefulness and initiative; the ability to handle, direct and coordinate mine inspection work of more than ordinary difficulty; and administrative ability of a high order.

Coal Mine Inspector.—Nine years of progressive practical experience in work connected largely with safety-of-operation of *coal* mines in the United States, including at least 3 years of difficult, important, and responsible specialized work in some supervisory capacity (such as mine foreman, mine superintendent, general superintendent, mining engineer, or safety engineer). This experience must have affirmatively demonstrated the applicant's initiative and resourcefulness; a considerable knowledge of the principles of mine safety work; and the ability to direct and perform mine inspection work of a high order.

Associate Coal Mine Inspector.—Seven years of progressive experience in practical *coal* mining within the United States, including considerable experience in mine safety work. At least 2 years of this experience must have been in moderately important specialized work in some responsible capacity (such as mine foreman, safety inspector, or mine superintendent) and must have affirmatively demonstrated the applicant's initiative and resourcefulness, and the ability to perform high class mine inspection work under only general direction.

Assistant Coal Mine Inspector.—Five years of practical experience in *coal* mining in the United States including experience in mine safety work and at least 2 of the 5 years must have been specialized work in some responsible capacity (such as assistant mine foreman, mine foreman, or safety inspector) which has demonstrated the applicant's initiative and resourcefulness, and the ability to perform the duties of a mine inspector under supervision.

Substitution of education for experience.—Courses in engineering successfully completed at a college or university of recognized standing may be substituted for the required experience, year for year, up to a maximum of 4 years for the positions of Senior Coal Mine Inspector and Coal Mine Inspector, and 2 years for the position of Associate Coal Mine Inspector, except that in every case the applicant must show the required experience of a specialized nature as listed above under the experience requirements for the various grades.

Note.—For all of the positions listed at the head of this announcement an applicant must show that his experience and training have included coal-mine operating or safety work, or technical work in practical mining engineering of such nature as to provide a thorough knowledge of those essentials necessary for competent coal-mine inspection.

Section 9 of the Act under which these positions are established provides: "That in the selection of persons for appointment as coal-mine inspectors no person shall be so selected unless he has the basic qualification of at least 5 years' practical experience in the mining of coal, and is recognized by the United States Bureau of Mines as having the training or experience of a practical mining engineer in those essentials necessary for competent coal-mine inspection."

(OVER)

Recency.—Applicants must show that at least 1 year of the prescribed experience was obtained within the 5 years immediately preceding the date of receipt of application.

Only education or experience acquired prior to the date of receipt of applications can be considered for these examinations.

3. **Age limits.**—Applicants must have reached their thirtieth birthday but must not have passed their fifty-fifth birthday on the date of receipt of application.

   The age limits do not apply to persons granted military preference because of military or naval service, except that such applicants must not have reached the retirement age.

   Applicants who attain eligibility and are selected for appointment must furnish proof of date of birth to the appointing officer at the time of reporting for duty. Applicants should *not* submit such proof to the Civil Service Commission. An extension of time for furnishing proof of date of birth, not to exceed 6 months after appointment, may be granted upon satisfactory evidence that additional time is necessary. Notices of rating sent to eligibles will contain further information.

4. **Physical ability.**—Applicants must be not over 74 inches in height and must be well proportioned as to height and weight. The duties of these positions are arduous and applicants must be of an active type with good muscular development, in good health and in sound physical condition and able to perform strenuous work for at least 2 hours while wearing mouth-breathing apparatus. Hernia (whether or not supported by truss), organic heart disease (whether or not compensated), chronic respiratory disease, or other serious physical disability will disqualify for appointment. Remediable defects or curable disease will not exclude a person from examination, but proof that such defects have been remedied, or the disease, if any, cured, must be received during the life of the eligible register before persons otherwise qualified may be considered for appointment under civil-service rules. Vision must be at least 20/40 (Snellen), each eye, without glasses, and ordinary conversation must be heard at a distance of at least 20 feet. At least four natural incisors or canines must be present in each jaw in position to hold the mouth-piece of the breathing apparatus. Applicants using detachable bridges or plates will not be accepted.

   A rigid physical examination will be made by a Federal medical officer or other duly licensed doctor of medicine before appointment. Persons who are offered appointment must pay their own expenses in reporting for duty. If, upon reporting at the place of assignment, they are found ineligible because of physical defects, they cannot be appointed and no part of their expenses in returning home can be borne by the Government.

Applicants must file with the United States Civil Service Commission, Washington, D. C., Application Form 8, properly executed, excluding the Officer's Certificate of Residence.

Caution.—Applicants should be careful to furnish all required information requested in the examination announcement and to answer all questions in the application form. Failure to do so may result in loss of opportunity to be considered for appointment when the register of eligibles is established.

Only one application should be filed by a person wishing to apply for two or more of these positions. (See paragraph headed "Assignment of grade" below.)

Proof of education.—Applicants may be required to present to the Commission proof of completion of the college courses claimed. Proof will be requested by the Commission, if required.

Assignment of grade.—Applicants for the higher grades who are found not qualified therefor will be considered for the appropriate lower grades. Persons who are found eligible for the higher grades will also be rated for the appropriate lower grades if they have expressed a willingness to accept the lower salaries.

Veteran preference.—Applicants who wish to claim veteran preference must file, in addition to Application Form 8, Preference Form 14 (blue), properly executed and accompanied by the documentary proof required therein. Failure to submit such evidence promptly may result in loss of opportunity to be considered for appointment.

Certification.—Certification to fill vacancies in these positions in the field service will be made of the highest eligibles on the appropriate register from the entire country who have not expressed unwillingness to accept appointment where the vacancy exists, except that certification may be restricted to residents of the State or group of States in which the vacancy exists, provided that satisfactory evidence is presented to the Commission, by the department or office requesting certification, showing that the needs of the service will be better met by such restricted certification. The department or office requesting certification of eligibles has the legal right to specify the sex desired.

If immediate appointment is necessary to meet the needs of the National Defense Program, the Commission may certify eligibles who are immediately available.

Fingerprints.—Fingerprints will be taken of all persons appointed from these examinations.

Application forms.—The necessary forms may be obtained from the **Secretary, Board of United States Civil Service Examiners, at any first- or second-class post office,** except in district headquarters' cities, listed below, where the forms must be obtained from the *United States Civil Service district office.* The forms may also be obtained from the United States Civil Service Commission, Washington, D. C. The title of the examination desired should be stated.

Atlanta, Ga., New Post Office Building.
Boston, Mass., Post Office and Courthouse Building.
Chicago, Ill., New Post Office Building.
Cincinnati, Ohio, Post Office and Courthouse.
Denver, Colo., New Customhouse.
New Orleans, La., Customhouse.
New York, N. Y., Federal Building, Christopher Street.
Philadelphia, Pa., Customhouse, Second and Chestnut Streets.
Seattle, Wash., Post Office Building.
St. Louis, Mo., New Federal Building.
St. Paul, Minn., Post Office and Customhouse.
San Francisco, Calif., Federal Office Building.
Honolulu, T. H., Federal Building.
Balboa Heights, Canal Zone, *Secretary, Board of United States Civil Service Examiners.*
San Juan, P. R., *Chairman, Puerto Rican Civil Service Commission.*

THE EXACT TITLE OF THE EXAMINATION DESIRED, AS GIVEN AT THE HEAD OF THIS ANNOUNCEMENT SHOULD BE STATED IN THE APPLICATION FORM

Issued July 14, 1941.

(106—2)

U. S. GOVERNMENT PRINTING OFFICE: 1941

APPENDIX D

SCHEDULE OF TRAINING FOR FIRST CLASS OF MINE INSPECTORS, NOVEMBER 17 TO DECEMBER 23, 1941

Group A

Date	9:00 a m. to 12:00 noon	12:30 to 4:30 p.m.	7:00 to 10:00 p.m.
November 17 Mon.	*Auditorium. Address by J. J. Forbes, Chief, Coal Mine Inspection Division. Rooms 256 and 258. Physical examinations; oaths of office and forms in connection with appointments.	*Rooms 256 and 258. Physical examinations; oaths of office and forms in connection with appointments.	
18 Tues.	Room 48. Mine rescue training by H. R. Burdelsky.	*Auditorium. Accident Prevention Course, Falls of Roof and Coal, by A. U. Miller.	*Room 48. Advanced mine rescue training, by F. E. Griffith.
19 Wed	do.	do.	*Auditorium. Advanced mine rescue training, by F. E. Griffith.
20 Thurs. Holiday			
21 Fri.	do	do.	do..
22 Sat.	do		
24 Mon.	do.	*Auditorium. Accident Prevention Course, Haulage, by W. H. Tomlinson.	*Auditorium. Instructions on procedure and methods to be followed in making mine inspections, by E. H. Denny. Discussion by S. H Ash.
25 Tues.	Auditorium. Work of Electrical Section, by E. J. Gleim.	do.	*Auditorium. Instructions on procedure to be followed in preparation of inspection reports, by C. A. Herbert.

APPENDIX D

SCHEDULE OF TRAINING FOR FORST CLASS OF MINE INSPECTORS, NOVEMBER 17 TO DECEMBER 23, 1941

Group B

9:00 a.m. to 12:00 noon	12:30 to 4:30 p.m.	7:00 to 10:00 p.m.
*Auditorium. Address by J. J. Forbes, Chief, Coal Mine Inspection Division. Room 256 and 258. Physical examinations; oaths of office and forms in connection with appointments.	*Rooms 256 and 258 Physical examinations; oaths of office and forms in connection with appointments.	
*Auditorium. Work of Electrical Section, by E. J. Gleim.	*Auditorium. Accident Prevention Course, Falls of Roof and Coal, by A. U. Miller.	*Room 48. Advanced mine rescue training, by F. E. Griffith.
Mech. Wing do.	do.	*Auditorium. Advanced mine rescue training, by F. E. Griffith.
	-	
Auditor. do. Mech. Wing do.	do.	Do.
Room 290. Work of Electrical Section, by A. B. Hooker.	*Auditorium. Accident Prevention Course, Haulage, by W. H Tomlinson.	*Auditorium. Instructions on procedure and methods to be followed in making mine inspections, by E. H. Denny. Discussions by S. H. Ash.
Room 48. Mine rescue training, by H. R. Burdelsky.	do.	*Auditorium. Instructions on procedure to be followed in preparation of inspection reports, by C. A. Herbert.

Original from THE OHIO STATE UNIVERSITY

Group A

Date	9:00 a.m. to 12:00 noon	12:30 to 4:30 p.m.	7:00 to 10:00 p.m.
26 Wed.	Mechanical Wing. (basement). Work of Electrical Section, by E. J. Gleim.	*Auditorium. Accident Prevention Course, Explosions and Fires, by S. H. Ash.	*Auditorium. Methods of collecting air and dust samples, by James Westfield, Jr.
27 Thurs.	Auditorium. Work of Electrical Section, by E. J. Gleim.	do.	*Auditorium. Advanced mine rescue training, by F. E. Griffith.
28 Fri.	Mechanical Wing. Work of Electrical Section, by E. J. Gleim.	*Auditorium. Accident Prevention Course, Explosives and Miscellaneous Accidents, by W. H. Tomlinson.	*Auditorium. Policies of Bureau in inspection work, by J. J. Forbes. Responsibilities of inspectors and importance of inspection work, by D. Harrington.
29 Sat.	Room 290. Work of Electrical Section, by A. B. Hooker.		
December 1 to 6	*Mine inspections. (All day.)	*Mine inspections	
8 Mon.	*Writing reports.	*Writing reports.	*Auditorium. Safety organization work, by M. J. Ankeny.
9 Tues.	do.	do.	*Auditorium. Motion picture work of the Safety Division, and showing pictures, by J. W. Pero.
10 Wed.	do.	do. *3:00 p.m. Auditorium. Superversion and cooperation as an aid in accident prevention, by A. U. Miller.	*Room 48. Use of water and wetting agents for allaying dust, by C. W. Owings.

Group B

9:00 a.m. to 12:00 noon	12:30 to 4:30 p.m.	7:00 to 10:00 p.m.
Room 48. Mine rescue training, by H. R. Burdelsky.	*Auditorium. Accident Prevention Course, Explosions and Fires, by S. H. Ash.	*Auditorium. Methods of collecting air and dust samples, by James Westfield, Jr.
do.	do.	*Auditorium. Advanced mine rescue training, by F. E. Griffith.
do.	*Auditorium. Accident Prevention Course, Explosives and Miscellaneous Accidents, by W. H. Tomlinson.	*Auditorium. Policies of Bureau in inspection work, by J. J. Forbes. Responsibilities of inspectors and importance of inspection work, by D. Harrington.
do.		
*Mine inspections. (All day.)	*Mine inspections.	
*Writing reports.	*Wrting reports.	*Auditorium. Safety Organization work, by M. J. Ankeny.
do.	do.	*Auditorium. Motion picture work of the Safety Division, and showing pictures, by J. W. Pero.
do.	do. *3:00 p.m. Auditorium. Supervision and co-operation as an aid in accident prevention, by A. U. Miller.	*Room 48. Use of water and wetting agents for allaying dust, by C. W. Owings.

Group A

Date	9:00 a.m. to 12:00 noon	12:30 to 4:30 p.m.	7:00 to 10:00 p.m.
11 Thurs.	*Writing reports	*Writing reports.	*Auditorium. Safety instruction course for miners, including demonstrations and pictures, by E. E. Quenon.
12 Fri.	do.	do.	*Auditorium. Metal-dust explosions and incendiary fires, by H. R. Brown. Paper work and forms, by J. F. Fleischut.
13 Sat	*Auditorium. The safe use of Cardox, by F. E. Griffith.		
15 Mon.	*Auditorium. Health work of the Bureau, by Dr. H.H. Schrenk; visit to dust laboratory.	*Auditorium. Work of coal laboratory, by H. M. Cooper; visit to coal laboratory.	*Room 48. First-aid training, by N. L. Muir.
16 Tues.	*Auditorium. Effect of temperature and humidity on mine roof, by H. P. Greenwald; visit to gas laboratory.	*Auditorium. Flame safety lamps and methane detectors, by L. C. Ilsley; visit to manhouse (A. B. Hooker).	do.
17 Wed.	*Auditorium. Storage, transportation, and use of explosives, by J. E. Tiffany; visit to gas mask laboratory.	*Auditorium. Inspector or Instructor, by Dean E. A. Holbrook, University of Pittsburgh.	do.
18 Thurs.	*Experimental Mine Explosibility of coal dust, by H P. Greenwald.	*Explosives testing station.	do.

Group B

9:00 a.m. to 12:00 noon	12:30 to 4:30 p.m.	7:00 to 10:00 p.m.
*Writing reports.	*Writing reports.	*Auditorium. Safety instruction course for miners, including demonstrations and pictures, by E. E. Quenon.
do.	do.	*Auditorium. Metal-dust explosions and incendiary fires, by H. R. Brown. Paper work and forms, by J. F. Fleischut.
*Auditorium. The safe use of Cardox, by F. E. Griffith.		
*Auditorium. Health work of the Bureau, by Dr. H.H. Schrenk; visit to dust laboratory.	*Auditorium. Work of coal laboratory, by H. M. Cooper; visit to coal laboratory.	*Room 48. First-aid training, by N. L. Muir.
*Auditorium. Effect of temperature and humidity on mine roof, by H. P. Greenwald; visit to gas laboratory.	*Auditorium. Flame safety lamps and methane detectors, by L. C. Ilsley; visit to manhouse (A. B. Hooker).	Do.
*Aduitorium. Storage, transportation, and use of explosives, by J. E. Tiffany; visit to gas mask laboratory.	*Auditorium. Inspector or Instructor, by Dean E. A. Holbrook, University of Pittsburgh.	Do.
*Experimental Mine. Explosibility of coal dust, by H. P. Greenwald.	*Explosives testing station.	Do.

Original from THE OHIO STATE UNIVERSITY

Group A

Date	9:00 a.m. to 12:00 noon	12:30 to 4:30 p.m.	7:00 to 10:00 p.m.
19 Fri.	*Visit to Mine Safety Appliances Co. plant.	*Visit to Mine Safety Appliances Co. plant.	
20 Sat	*Room 48. First-aid training, by N. L. Muir.		
22 Mon.	*Experimental Mine. Mine rescue maneuvers.	*Experimental Mine. Mine rescue maneuvers.	*Experimental Mine. Mine rescue maneuvers.
23 Tues.	do.	do.	do.

*Both groups.

Original from THE OHIO STATE UNIVERSITY

Group B

9:00 a.m. to 12:00 noon	12:30 to 4:30 p.m.	7:00 to 10:00 p.m.
*Visit to Mine Safety Appliances Co. plant.	*Visit to Mine Safety Appliances Co. plant.	
*Room 48. First-aid training, by N. L. Muir.		
*Experimental Mine. Mine rescue maneuvers.	*Experimental Mine. Mine rescue maneuvers.	*Experimental Mine. Mine rescue maneuvers.
do.	do.	Do.

*Both groups.

APPENDIX E

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

PRELIMINARY REPORT

Company________________________________Mine______________________________

Location____
(Town) (County) (State)

Date of Inspection____________Inspector_____________________________

The facts disclosed by the inspection of this mine, including both commendable conditions and practices and those which should be given corrective measures, will be embodied in a detailed report to"be made available to the public; in acordance with the Federal Coal Mine Inspection and Investigation Act of 1941, H.R. 2082.

The purpose of this preliminary report is to point out good features as well as certain unsafe practices and conditions that should be corrected promptly.

Ventilation____

Original from THE OHIO STATE UNIVERSITY

Air at working faces____________________

Gas____________________

Control of coal dust____________________

Rock-Dusting____________________

Explosives

Electrical Equipment, Wiring, and Guarding

Timbering

Haulage - Roadways, etc.

Lighting

Underground - General

Surface Hazards

Cages and other Hoisting Equipment

Cooperation

General Comments

Signed
Inspector

APPENDIX F

Mine Safety-Inspection Report

FOR

Coal Mines

1. Name of inspector
2. Date of inspection

GENERAL INFORMATION

3. Name of mine
4. Name of operating company
5. Mine location (State, county, town, distance, direction from town, railroad)
6. Name and address of operating officials:
   - *a.* President
   - *b.* Gen. Mgr. or Gen. Supt.
   - *c.* Chief engineer
   - *d.* Superintendent
   - *e.* Safety engineer
   - *f.* Mine foreman
7. Other mines operated by same company
8. To whom should report be sent? (Give in letter of transmittal and not in body of report.)

   Address
9. History of mine and district. (Give approximate date mine was opened. Make statement as to explosions, fires, or other disasters occurring in this mine, and fires and explosions occurring in adjoining or adjacent mines working same coal bed.)
10. Type of mine:

    Number of openings

    Drift

    Slope; pitch; length

    Shaft; depth

    Number of compartments
11. Coal bed:
    - *a.* Geological and local designation

      Average thickness Dip

      Kind of coal Maximum cover
    - *b.* Number of beds worked
    - *c.* Impurities (show sketch of section of coal bed)
    - *d.* Analysis of coal (source)
12. Number of employees:
    - *a.* Underground (by occupations)
    - *b.* Surface (by occupations)
13. Production:
    - *a.* Daily average
    - *b.* Maximum daily
    - *c.* For year
    - *d.* Probable life of mine
    - *e.* Number of shifts worked per day
    - *f.* Percentage of production loaded mechanically
    - *g.* Capacity

SURFACE PLANT AND EQUIPMENT

14. Tipple and cleaning plant:
    - *a.* Capacity (each)
    - *b.* Construction
    - *c.* Fire protection
    - *d.* Sizes of coal produced
    - *e.* Type of screens
    - *f.* System of cleaning coal
    - *g.* Wiring properly installed in conduit
    - *h.* Enclosed-type motors and switches
    - *i.* Dust hazard, precaution taken

      Frequency and method of cleaning or allaying
    - *j.* Stairways: (Condition and adequacy)

      Guarded
    - *k.* Machinery and belts guarded
    - *l.* Is coal treated with oil before loading?
    - *m.* Are there any hazards connected with oil treatment?
    - *n.* Any other hazards noted (open stoves, etc.)
15. Refuse disposal:
    - *a.* Dump car Larry

      Aerial tram Truck
    - *b.* Distance of waste dump from intake opening
    - *c.* Hazards in connection with refuse disposal (describe)
    - *d.* Waste dump fires (how handled or controlled)

16. Coal-storage bins:
- *a.* Capacity and distance from mine openings
- *b.* Spontaneous fires in storage of coal

17. Head frame (if shaft mine)
- *a.* Type of construction (steel, wood, etc.)
- *b.* Is there a railed platform at headsheaves?
- *c.* Railed stairway or properly guarded ladder leading thereto?
- *d.* How often are sheaves inspected and oiled?
- *e.* Is this inspection recorded?

18. Surface haulage (if drift or slope):
- *a.* Condition of track Roadbed
- *b.* Clearance
- *c.* Are frogs and guardrails blocked?
- *d.* Slope leading to surface:
  - Condition of track
  - Type of drags used—derails or safety blocks
  - Clearance
- *e.* Are man-trips operated on slope?
- *f.* What safety precautions are taken?
- *g.* Guarding electric wires
  - Distance above rail
- *h.* Outside planes or inclines
  - Pitch Length
  - Positive stop blocks at top
  - Derail near top
  - Derail near tipple
  - Drags
  - Is barney or monitor used?
  - Are man-trips operated on surface planes?
  - What safety precautions are taken?
- *i.* Safety and method of handling railroad cars
  - Suitable brake stick and pinch bar used by brakeman
  - Suitable safety belt used by brakeman
  - Crossing guards
  - Derail devices on side tracks

19. Hoisting equipment:
- *a.* Type How driven
- *b.* Overwind device Speed control
  - Reliable indicator
  - Other safety features

19. Hoisting equipment—Continued.
- *c.* Engine house:
  - Construction
  - Fire protection
- *d.* Are hoisting engines placed so that noise of other machinery will not prevent engineer from hearing signals?
- *e.* Are periodic physical examinations given engineer?
- *f.* Is a second engineer in attendance when men are hoisted or lowered?
- *g.* Signal code
  - Where located
- *h.* Is hoisting equipment inspected? (including rope)
  - How often? By whom?

20. Cages:
- *a.* Type
  - Bonnet
- *b.* Bars, chains, or gates across ends
- *c.* Lining or rail and toe board on guide sides
- *d.* Handholds
- *e.* Bridle chains
  - Sides of cage enclosed
- *f.* Safety catches:
  - Frequency of tests
  - Is record kept of tests?
- *g.* How often are cage, guides, and shaft lining inspected?
- *h.* Is there a positive stop block at surface landing?
- *i.* Kind of gates provided at surface landing
- *j.* Is cager in charge when men are handled?
- *k.* Maximum number of men allowed on cage
- *l.* Method of signaling
- *m.* Are movable parts locked when men are carried?
- *n.* Are tools carried on cage with men?
- *o.* Speed of hoisting men
- *p.* Can signals be given from cage?
- *q.* Safety gates at ground and intermediate levels

21. Steam plant:
- *a.* Number of boilers Size Type
- *b.* Building Distance from mine opening
- *c.* How often are boilers inspected?
- *d.* Safety devices
- *e.* Number of exits from boiler room

22. Electric power plant:
- *a.* Number of generators Type
  - Alternating current or direct current
  - Voltage kilovolt-amperes or kilowatt rating
  - Properly grounded
- *b.* Safety of installation
- *c.* Kind of building
  - Fire protection
- *d.* Switchboard
  - Adequately guarded
  - Rubber mat on floor
  - Ample space around and back
  - Is control readily accessible for emergency shut-down?
- *e.* Fire hazards
- *f.* Oil storage
- *g.* Cleanliness
- *h.* If power purchased, from whom?
- *i.* Voltage received at
- *j.* Auxiliary power lines

23. **Surface transformer station:**
- *a.* Are transformers well-installed?
  - Type of building
- *b.* How guarded or enclosed?
- *c.* Is door or gate kept locked?
- *d.* Are transformers properly grounded?
- *e.* Voltage, incoming Outgoing
- *f.* Are proper lightning arresters installed?

24. Substation:
- *a.* Kind of building
  - Fire protection
- *b.* Motor-generator sets
  - Voltage, alternating current Direct current
- *c.* Properly grounded
- *d.* Switchboard:
  - Adequately guarded
  - Rubber mat or insulated platform on floor
- *e.* Circuit breakers and fuses
- *f.* Is door to building kept locked?

25. **Surface power and trolley lines:**
- *a.* Height of trolley wire above rail
- *b.* Guarding of wires, method
- *c.* Securely supported on insulated hangers
- *d.* Alinement

26. **Shops:**
- *a.* Building
  - Fire protection
- *b.* Wiring
- *c.* Machine and belt guards

26. Shops—Continued.
- *d.* Open repair pit
  - Is pit covered when not in use?
- *e.* Use of goggles Type
- *f.* Condition of hand tools
- *g.* Cleanliness of building
- *h.* Safety of electrical equipment
- *i.* Illumination
- *j.* How heated
- *k.* Are all electric machines properly grounded?

27. **Fan and fan house:**
- *a.* Location of fan
- *b.* Type of fan Size Capacity
- *c.* How driven Motor voltage Hp.
  - Operating exhausting or blowing
- *d.* Is there reserve power? Auxiliary fan?
  - How often tested and how long to make changes?
- *e.* Location of fan in relation to opening
- *f.* Can air current be reversed?
  - If so, how often tested?
- *g.* Explosion doors or weak wall
- *h.* Water gage Kind
- *i.* Signal device to show when fan slows down or stops
- *j.* Are fan and fan-house casing of incombustible material?
- *k.* How often inspected? By whom?
- *l.* Is fan on independent circuit?
- *m.* Is fan run continuously?
- *n.* When stopped are men all out of mine?
- *o.* How long before men enter is fan started?

28. **Explosives-storage magazine.**
- *a.* Material of construction
- *b.* Kind of floor
- *c.* Capacity Maximum stored
- *d.* Distance from nearest mine entrance
  - From nearest building?
  - From public highway?
  - From stationary electrical equipment?
  - From burning refuse dump?
- *e.* Barricaded? How?
- *f.* Danger signs properly located
- *g.* Properly screened ventilators
- *h.* Illumination of magazine
  - Location of switch
- *i.* Is other material stored in magazine?

28. Explosives-storage magazine—Continued.

j. Is area around magazine kept free of dry grass, brush, and other combustible material?

Cleanliness of magazine

k. How is excess summer temperature prevented?

l. How secured against unlawful entry?

m. Frequency of delivery to

n. Is fuse tested to determine burning rate?

o. Are electric detonators tested with galvanometer?

p. What disposal is made of old explosives and detonators?

29. Distributing magazines:

a. Material of construction

b. Distance from nearest mine opening

From nearest building

c. Is more than 1 day's supply of explosives kept in magazine?

d. Illumination of magazine

Location of switch

e. Tools used for opening boxes

f. Are there separate distributing magazines for explosives and detonators? Distance apart

g. Are other things stored with explosives?

With detonators?

h. Do unauthorized persons enter magazine?

i. Method of distributing explosives

j. How are explosives delivered to magazines?

k. Is record kept of explosives and detonators issued and returned?

30. Wash house:

a. Description

b. Fire hazards

c. Cleanliness

d. Are toilet facilities provided?

e. Illumination

f. How heated?

g. How ventilated

h. Disinfectant foot bath

i. Capacity

31. Supply house:

a. Construction

b. Fire protection

c. Orderly method of storing

d. Illumination

e. How heated

32. Lamp house:

a. Construction

b. Equipment

c. Where is fuel stored?

d. Illumination

e. How heated

f. Kind of electric cap lamps Number

Maintenance

g. Kind of flame safety lamps Number

Maintenance

Method of testing

33. Other buildings: Describe

34. Yards and material storage:

a. Are roads, paths, and walks kept free from obstructions?

b. Are timbers, ties, and rails properly stored and piled?

c. Are scrap iron and old cars properly stored?

35. Surface fire protection:

a. Is any inflammable building within 100 feet of mine opening?

b. Describe fire protection provided

c. Is fire-extinguishing equipment tested?

How often?

d. Method of storing oil on surface

Describe any hazards

36. Water supply, sanitation, housing of employees

37. System of checking men into and out of mine (describe fully)

UNDERGROUND MINING METHODS, CONDITIONS, AND EQUIPMENT

38. System of mining (longwall, room-and-pillar, butt entries, panels, long faces, etc.):

a. Is mine laid out with reference to butts and faces?

b. Number of main entries (2, 3, 4, etc.)

c. Distance between levels or cross entries

d. Number of side entries (double, triple, etc.)

e. Entry width Pillar width

Brushed Distance between crosscuts

38. System of mining—Continued.

f. Rooms: Width .... Pillar width ....
Length .... Distance between crosscuts ....

g. Are rooms turned off aircourses? ....

h. Are rooms of one entry driven into rooms of an adjacent entry?
....

i. Describe longface or longwall method used ....
....

j. Are pillars recovered? .... (describe method) ....
....
Is a definite pillar line maintained? .... What method is used to maintain pillar line? ....
....

k. Is coal cut or sheared? .... Is cutting done in floor or coal? .... Are cuttings left in mine or loaded out? .... Are cuttings loaded out before or after shooting? .... Depth of cut or shear ....

l. Percentage of coal recovered in first mining ....

m. Total recovery, excluding roof coal ....
Including roof coal ....

39. Roof and floor:

a. Immediate roof (kind and quality, thickness of draw slate or roof coal) ....
....

b. Main roof (kind, average thickness, maximum cover) ....
....

c. Frequency of slips, rolls, pots, horsebacks, faults, and clay veins ....
....

d. Floor: Kind .... Soft or hard ....
Smooth or rough ....

40. Timbering:

a. Entry timbering:
Is dangerous or doubtful slate, rock, or coal promptly taken down? .... Or timbered? ....
When? ....
Method of timbering ....
....
Are entries adequately timbered? ....
Are safety posts used? ....
Is entry roof tested? ....
Method of protection for pots, kettle bottoms, horsebacks, etc. ....

b. Room timbering:
Is dangerous or doubtful slate, rock, or coal promptly taken down? .... Or timbered? ....
When? ....
Number rows of posts .... Distance between posts .... Or crossbars ....
Distance from face ....

40. Timbering—Continued.

c. System of timbering in pillar work ....
....
....

d. System of timbering in pitching coal bed ....
....
....
....

e. System of timbering in wide faces or longwall ....
....
....
....

f. Are prepared cap pieces and wedges provided? ....
Size ....

g. If prepared cap pieces are not provided, are those used adequate? ....

h. Is the coal spragged after undercutting? ....

i. Recovery of timber:
Method used in removing safety posts ....
Are timbers recovered? .... How? ....
....
Who supervises timber recovery? ....

j. Timbering regulations:
Are there systematic timbering rules? ....
Verbal or printed ....
Is timbering diagram or map provided? ....
Are timbering rules strictly enforced? ....

k. How is roof tested? .... How often? ....

41. Explosives and blasting:

a. Method of transporting explosives underground and to face
....

b. Type of explosives car used ....

c. Type of receptacle used for carrying and storing explosives underground ....
Detonators ....

d. Storage underground:
How? ....
Where? ....

e. Maximum amount explosives allowed miner per day ....

f. How are explosives handled and used in mechanical mining?
....

g. Explosives:
Kind for blasting coal ....
Brushing ....
Size and weight of cartridges ....

h. Detonators: Electric ....
Strength ....
Are ends of legs shorted? ....

i. How, where, and when is primer made? ....
....

Original from THE OHIO STATE UNIVERSITY

41. Explosives and blasting—Continued.

j. Firing method:

By electricity from surface

Electric power lines in mine

Battery Kind

Permissible Fuse

Squibs If fuse or squib, how ignited?

k. Firing cables:

Type of cable

Condition as to length

As to insulation

Is cable wound up after each shot or left strung out in gob on floor or on timbers?

Is battery end of cable kept shorted?

Are firing ends of cable staggered?

l. Charge:

Maximum and average amount

Distance apart and depth of holes (with total and respect to depth of cut)

Are mixed charges allowed?

Position of primer in charge

Direction detonator points

Tool used for making hole in cartridge for detonator

m. Loading holes:

By whom

Are cartridges slit?

Is explosive rammed?

Are charges air-spaced? If so, how?

How is hole cleaned out?

n. Stemming:

Material used

Prepared in dummies Length of dummies

Are holes stemmed to the collar?

Type of tamping bar

Is face region kept free from coal dust?

o. Blasting:

By whom done, miner or shot firer

Number of shot firers

Are shot firers certified men, and what grade certificate?

Number of shots fired at one time

Time of firing Are men out of mine?

Are tests for gas made before and following shooting?

Are fire runs made after shooting?

41. Explosives and blasting—Continued.

***o.* Blasting —Continued.**

Is ample warning given before shooting?

How?

What precautions are taken when two places are coming together?

If shot firers are used, do they make written report of amount of explosives used, condition, etc?

***p.* Are adjacent shots fired simultaneously?**

Are dependent shots fired?

Are nearby shots fired in rapid succession?

***q.* Do blow-out shots occur?**

***r.* Are bulldozing shots ever used?**

***s.* Misfires:**

Care and method of examination

Interval before return

Method of removal

***t.* Careless use or handling of explosives, detonators, fuse, squibs, etc. (describe)**

u. If black blasting powder (granular, pellet, or stick) is used, describe method of handling

v. If Cardox is used, describe method of handling and use

***w.* Are open lights used near explosives?**

42. Ventilation and gas:

a. Volume of air:

Main intake Main return

Number of splits Volume, each split

Volume, last open crosscut on each split

b. Aircourses:

Are they adequate in number and size?

Obstructions (describe)

c. Maximum number of men employed on one split of air

d. General adequacy of air at working faces

***e.* Is haulage, hoisting, or manways on return air?**

***f.* Line brattices:**

Are they used in working places?

Are they extended close enough to face?

Is board used at top and bottom?

Is there sufficient space between brattice and rib?

Are they well-maintained?

Is brattice material fire-resistant?

***g.* Crosscuts:**

Maximum distance between

Is more than one crosscut open between last stopping and face?

Original from THE OHIO STATE UNIVERSITY

42. Ventilation and gas—Continued.

h. **Old workings:**

Ventilated or securely sealed

Type of seal

Method, if any, of relieving gas pressure behind seals

Is provision made for sampling air behind seals?

What is nature of atmosphere behind seals?

Does air from old workings pass through working places?

i. **Is a good ventilation map maintained?**

j. **Booster and blower fans in mine:**

Number **Type**

Are fan motors permissible?

Are fan intakes in fresh air?

Volume of air passing fan intake

Volume of air supplied by blower

Volume of air recirculated

Is unit properly installed?

Is wiring properly grounded?

Type of fan tubing

Condition

k. **Stoppings:**

Material of construction, entries

Rooms

Are stoppings well-sealed into rib and roof?

Are entry stoppings provided with small openings at intervals? Size of opening

Type of door

l. **Overcasts:**

Material of construction

Are approaches easy or abrupt?

m. **Doors:**

Number Construction

Condition as to tightness

On main haulageways

In pairs or singly

Are doors equipped with latches?

Are doors provided with small windows?

What would be the effect or danger if doors were left open?

Are trappers employed?

n. **Regulators:**

Number Type

o. Is mine rated as gassy by State mining department?

p. Frequency of gas being reported

q. May gas be suddenly liberated?

Is mine free from standing gas?

42. Ventilation and gas—Continued.

r. **Is mine connected with a gassy or other mine?**

Name

Is connection sealed or isolation otherwise afforded?

Describe

s. **Gas inspection and testing:**

By whom? **When?**

How reported?

If gas is found, when and how is it removed?

Do firebosses carry open lights or electric cap lamps when making inspections?

Do firebosses use electric locomotives to travel in and out of mine?

Number of certified firebosses

Type of flame safety lamps used

Maintained by whom?

Are flame safety lamps examined and tested?

When? **How?**

Is fireboss' record countersigned by mine foreman?

Do machinemen use flame safety lamps?

How are they trained in their use?

Type of methane detector used, if any

Is return air tested periodically?

Are places found with standing gas fenced off?

Does fireboss leave evidence of his examination in each place?

Does fireboss record the results of his inspections?

t. **Gas-ignition hazards:**

Is electrical equipment operated on other than pure intake air?

Electric arcing or sparking, hazards from, if any

Miners' lights, kind, number

Other mine illumination

Is smoking permitted underground?

Are men searched for smoking material?

Have there been accidents from methane ignition?

Describe

u. **Does the company regularly sample and analyze mine air?**

Who analyzes samples?

Interpret and discuss analysis of air samples

Are haulageways on return air?

43. **Dust:**

a. What are principal sources of dust?

Air samples

Bottle No.	Location	Time	Date	Anemometer Reading	Area	Air Per Minute, Cu. Ft.	CH_4 Reading in Detector or Lamp

Dust samples

Can No.	Location	Date	Rib, Roof, or Road Dust	Rock-Dusted Area

43. Dust—Continued.

b. **Accumulation of coal dust on roadways, rib, roof, timbers, or gob in working places (describe bad conditions)**

c. **Accumulation of coal dust on entries and aircourses (describe bad conditions)**

d. **Is coal used for track ballast?**

e. **Is coal topped above cars?**

f. **Are cars leaky?**

g. **Are ribs and roof dusty?** **Dry or moist**

h. **Are roadways dry or wet?**

i. **Are accumulations of coal dust thoroughly removed?**
How often?

j. **Method of humidifying (describe)**

k. **Is water used to allay dust (before and after blasting, on mining machines, loading machines, conveyors, loading stations while in use, and face regions)?**

l. **Is wetting agent used?** **How?**

m. **Application of rock dust (describe in full)**

n. **Do workers wear respirators in dusty operations?**

o. **Is periodic sampling of dust done?**

p. **Type rock-dusting machine used**

q. **Samples and data as to incombustibles (interpret and discuss analysis)**

44. **Haulage underground:**

a. **System of haulage:**
Main haulage
Other haulage (conveyors, shuttle cars)

b. **Grade, dips, curves, and alinement of track**

c. **Road beds:**
Ballasting material
Wet or dry
Cleanliness of road beds

d. **Track:** **Gage**
Weight of rails, main line Side entries
Rooms
Splice bars
Tie plates, condition of

44. Haulage underground—Continued.

e. **Ties:**
Material, size, spacing, condition of main line
Side entries
Rooms

f. **Proper curves, rails** properly fastened down

g. **Switches:**
Type Condition
Clearance of throws and at switches
Blocking
Are switch throws in shelter holes?
Stumbling hazard of switch bar
Illumination

h. **Frogs:**
Guard rails
Blocking

i. **Derails or safety blocks, location and general description**

j. **Clearance** (roof, rib, timbering, and trolley or power wires):
On entries In rooms **At partings**
Is gob or other material stored on clearance side?
Other stumbling hazards

k. **Shelter holes:**
Distance apart **Size**
How marked Are they kept clean?

l. **Underground hoists:**
Location and ventilation
Type
Safety (same information as for main hoist, guards, **brakes**, etc.)
Cleanliness
Illumination
Fire hazard and protection
Is electrical equipment properly grounded and fused?
Room hoists (describe hazards)

m. **Rope:**
Condition and size
How often inspected, oiled, and resocketed?
Is written record of inspection kept?
Condition of rollers

44. Haulage underground—Continued.

m. Rope—Continued.

If slope haulage, are effective drags used?

n. Locomotives:

Trolley, cable-reel, permissible battery, or combination

Number Type

Size Voltage

General condition of

Headlights, condition of

Controller handle and covers fastened down

Are all motors equipped with a gong or other warning device?

Condition of cables and wiring

Condition of fuses, circuit breakers, or switches

Type nips used

o. Animal haulage:

Number and general condition of animals

Underground stable: Location, cleanliness, ventilation, fire protection, illumination, water supply

Storage of hay or other combustible material

Do animals carry lights?

Where does driver ride?

p. Cars:

Material Type

Capacity Tightness

Brakes or sprags, safety and condition of

Type couplings

Are they heat-treated at regular intervals?

q. Maintenance of haulage equipment:

Good Fair Poor

r. Illumination of haulageways:

Spacing of lamps

Size of lamps

Are lamps safely installed?

s. Are trip lights used on rear of all trips?

On front of all pushed trips of three cars or more?

On front and rear of rope trips?

44. Haulage underground—Continued.

t. How is haulage controlled (automatic block signals, dispatcher, or trapper)?

How is too high speed prevented?

u. Blocking cars:

Type of car stops used at working faces

Are trips of cars left standing on entries blocked?

If so, how?

v. Man-trips:

If locomotive-hauled, maximum speed

Is trip in charge of an official?

Does trip come to full stop before men unload?

Are tools carried in same car with men?

Are explosives carried on man-trips?

Do men get off moving trip?

Is power cut off trolley wire or is it guarded at loading and unloading stations?

Do men ride on trolley side?

Are rails, lumber, or other supplies hauled on man-trip?

If slope haulage, how is rope fastened to load?

Does rope rider or other official familiar with signals ride man-trip?

Is a safety coupling provided?

Are safety couplings used?

Is there an inspection of rope, couplings, and hoisting engine daily?

Do brakemen run ahead of moving trips to throw switches and to open doors?

Are trips pushed?

What method is used to rerail cars?

Type clothing worn by haulage employees

Safety of position of trip rider on trip

Does trip rider use whistle to signal motorman?

Other safety precautions taken

Are suitable waiting places with seats provided underground?

w. Miscellaneous haulage hazards:

Cleanliness of haulageways

Do men travel haulageways or are manways provided?

Condition of manways

44. Haulage underground—Continued.

w. Miscellaneous haulage hazards —Continued.

Are gates provided where manway crosses haulageway?

Is there a run-around at each shaft landing?

Do men or officials ride loaded trips?

Do haulage employees jump on or off moving trips?

Are flying switches permitted?

Is back-poling practiced?

Is nipping practiced?

45. Electricity underground:

a. Transmission lines:

How are lines taken into mine (drillholes, shaft, through drift opening)?

In intake or return airway?

Are power wires over 650 volts in armored cables?

Are power wires properly installed on insulators?

Are power wires installed in trenches cut in floor or rib?

Are armored cables frequently grounded?

Location of power wires with respect to trolley wires

Are power wires adequately guarded at points where men must pass under them? How?

Are power wires insulated where they pass through doors, curtains, etc.?

Contact hazards

Arcing hazards

Sectional switches

Location Type

b. Trolley wires:

Is wire securely supported on insulated hangers?

Position and distance above and outside of track

Protection of crossings (describe)

Protection at other dangerous places

Fire hazard (contact with inflammable material)

Is wire on opposite side of track from clearance?

Is trolley wire sectionalized by cut-out switches?

Length of sections

Are connections to trolley wire for pumps, lights, etc., made with proper fittings?

Are trolley frogs and cut-out switches provided at branch roads?

Are terminals of trolley and feed wires cut off?

Are insulated turnbuckles used?

Do trolley switches have insulated handles?

Are rails well-bonded? Cross-bonded?

Distance between

45. Electricity underground—Continued.

c. Storage-battery equipment:

Are battery locomotives used?

Permissible type?

Maintained in permissible condition?

Other equipment (power tanks, shuttle cars)

Are battery-box covers insulated underneath?

Are battery charging stations located on pure intake air?

Are battery trays blocked to prevent shifting?

Are battery cell tops clean?

Location of charging station

Ventilation

Condition of

d. Telephone system:

Number and location

Permissible type

Operating condition

Are telephone wires located near power wires?

Are telephone wires properly installed and grounded?

e. Signaling system:

Describe system

Voltage on wires

Source of power

Sparking hazards

Is transformer effectively grounded?

f. Shot-firing circuit (if shots fired from outside mine) (describe)

g. Underground transformer station:

Type of transformer (air-cooled, oil-filled, or pyranol, inerteen-filled)

Location

Construction

Is firedoor provided?

Ventilation

Voltage, incoming Outgoing

Properly grounded

Is wiring properly installed?

Fire hazard and protection

Contact hazard

Cleanliness

Is station kept locked?

45. Electricity underground—Continued.

h. Underground motor-generator or rotary converter station:

Location and description

Number M-G sets Voltage, alternating current Direct current

Properly grounded

Switchboard, adequately guarded

Ample space around and back of switchboard

Rubber mat on floor

Is control readily accessible for emergency shut-down?

Circuit breakers and fuses

Fire hazard and protection

Is station kept locked?

Mercury-arc rectifier

Safety of installation

i. Circuit breakers:

Automatic or hand-operated

If automatic, are they properly adjusted?

If hand-operated, are they tied in the "in" position?

j. Coal-cutting and other face electrical equipment:

Number machines Type Voltage

Length of cutter bar

Are machines of permissible type?

Are machines maintained in a permissible condition?

Are machines provided with a separate ground circuit?

Are machines properly fused?

Is guard provided for cutter chain?

Are machines kept in good repair?

Inspected by whom?

How often?

Is inspection record kept?

If inspection forms are used, procure and include copy

Is water used during cutting?

How are water sprays installed?

How attached to power wire

Give tabulation of defects observed on permissible equipment

k. Cables:

Type used Condition

How are temporary splices made?

How long are temporary splices used?

Are cable splices electrically and mechanically strong?

Are permanent splices vulcanized?

Is permanent splicing done underground or on surface?

Is trailing cable, used in mechanical loading operations, kept coiled?

Is a record kept of cable defects and repairs?

45. Electricity underground—Continued.

k. Cables—Continued.

Are spare cables kept to replace ones being repaired?

Is trailing cable protected by fuse or equivalent?

If trolley tap used, is it fitted with proper fuse?

If trolley tap not used, is safe method used to connect to power circuit?

l. Pumps:

Number Kind

Permissible type

Condition of wiring

Open or enclosed switches

Fuses Properly grounded

Insulated platform provided

Gears properly guarded

Are pump and wiring protected from roof falls?

On intake or return airways

m. Mechanical loaders, conveyors, scrapers, etc.:

Give brief description of method of working

Kind Number

Permissible type

Condition of machine and wiring

Apparent hazards

Accidents

Number of men on crew Duties of each

Tons of coal per machine

Is water used on coal or machine?

Are machines grounded?

Type switches

Fuses or circuit breaker

Method of connection to source of power

Is machine stopped frequently to test roof?

Illumination

Dustiness Is water used?

Is supply of rock dust and fire extinguishers provided?

n. Other electrical equipment:

Miscellaneous motors, etc.

o. Inspection of electrical system and equipment:

By whom, how often, how reported?

p. Is map of electrical system maintained?

46. Fire protection underground:

a. Are there water pipe lines throughout the mine?

b. Frequency of water taps

46. Fire protection underground—Continued.

c. **Is hose kept at stations underground?**
How many stations?
d. **Length and diameter of hose**
e. **How often tested?**
f. **Fire extinguishers:**
Number and kind
Where located
How often tested
g. **Is water always available?**
Source **Adequate amount**
h. **Are brattice cloth and other emergency fire-fighting equipment and supplies available?**
i. **What precautions taken for storage of oil and other inflammable material?**
j. **Are fire runs made after shooting?**

47. Protective clothing:

a. **Type of goggles used**
Are they worn continuously underground?
b. **Type safety hats used**
c. **Safety shoes used**
d. **Other protective clothing**
e. **What has been injury-reduction experience since adopting protective clothing?**

48. Miscellaneous hazards:

a. **Mine fires (hazards, method of prevention, fire-fighting methods and equipment)**
Is coal subject to spontaneous fires?
b. **Flood hazard:**
Is there an accumulation of water in adjoining mine?
Head of water **feet. Is barrier maintained?**
Thickness **feet.**
Are workings under stream or body of water?
Are openings subject to probable hazard from flood or cloudburst?
Are openings protected?
Method of approaching abandoned or standing workings filled possibly with water or gas
Are emergency escapeways maintained?

48. Miscellaneous hazards—Continued.

c. **Tools:**
Are miners required to provide full sets of tools?
Is periodic inspection of tools made?
By whom?
Were any faulty tools observed?
Length of ax handles, if used
d. **Oil and gas wells:**
Are there oil or gas wells penetrating coal measure?
Active **Abandoned**
Are wells protected by coal pillars?
Size of pillar
Are abandoned wells properly plugged?
Are wells accurately located on mine map?
e. **Supplies and materials:**
Carelessness in handling and storing timber, ties, rails, cap pieces gob, etc., along track or in working places (describe)
f. **Describe fully any health hazards to employees (such as dust, gases from explosives, etc.)**
g. **Escapeways from mine:**
Adequate **Safe**
h. **Give data as to any other hazards noted**

GENERAL SAFETY CONDITIONS

49. Supervision and discipline:

a. **What are your general impressions as to type and character of officials from your observations of the appearance and operation of the mine, both inside and out?**
b. **How many men are working under each faceboss?**
c. **How many times per day does he visit each working place?**
What is the total daily number of visits made by the various officials to each working place?

49. Supervision and discipline—Continued.

d. Are they hurried in their visits because of size of territory, or do they have time to properly inspect each working place? ....

....

e. Do officials mark the date and their initials at face of each place visited? ....

f. When they give orders, do they insist on their being carried out by the men? ....

g. If men fail or refuse to carry out orders, are they disciplined in any way? ....

h. Are facebosses required to perform other than supervisory work? ....

....

i. Are facebosses, firebosses, shot firers, and cutting-machine and mechanical-loader operators certified men? ....

j. Are eyes of those required to test for gas in good condition or fitted with glasses? ....

k. Does discipline appear to be good? ....
Fair? .... Poor? ....

l. Do men appear to receive orders without resentment? ....

m. Are orders willingly carried out? ....

50. Safety organization:

a. Is a safety organization maintained? ....
Describe ....

....

b. Is a safety engineer or inspector employed? ....
What are duties and authority of safety inspector? ....

....

c. Describe in detail methods used by company officials and miners' committees in maintaining and promoting interest of employees in safety ....

....

....

d. Does there appear to be a spirit of cooperation between the men and company officials relative to accident prevention?

....

e. Is there a spirit of rivalry between this mine and other mines of this same or other companies regarding accident prevention? ....

....

f. Is there a bonus system by which the officials or miners are rewarded for good accident records and penalized for poor accident records? ....

....

51. Safety rules and standards:

a. Is there a definite set of mine rules or operating standards covering the general operations of the mine and the proper method of performing the various usual kinds of work? (If possible, obtain copy of mine rules) ....

b. Are these rules printed? .... In what form? ....

c. What method is used to acquaint employees with mine rules?

....

....

d. Do the officials insist upon the enforcement of these rules?

....

52. Safety meetings:

a. Are safety meetings held? .... How often? ....

b. Do meetings include both men and officials? ....

c. Are safety rallies including women and children held? ....
How often? ....

d. What other means are used to maintain interest in safety?

....

....

....

53. Bulletin boards:

a. Is a safety bulletin board provided? ....

b. Are safety bulletins provided? ....

c. In what other effective manner is safety literature distributed to miners? ....

54. First aid and mine rescue:

a. How many men have been trained:
First aid .... Mine rescue ....
Advanced mine rescue .... Accident prevention ....

b. Are men given additional training? ....
How often? ....
Date of last first-aid and mine rescue training ....

c. Are employees instructed in the use of barricades? ....

d. Is there an underground hospital or first-aid station? ....

e. Is adequate material provided? ....

f. Nearest general hospital ....

g. Breathing apparatus:
Number .... Type ....

h. Is apparatus in condition for wearing? ....

i. How often tested? .... By whom? ....

j. Condition and amount of supplies ....

k. Number and type of gas masks ....
Condition ....

l. Are self-rescuers used? ....

m. Is a mine rescue crew maintained? ....

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54. **First aid and mine rescue—Continued.**

a. **Does this mine have access to a joint or State-owned rescue station?** ……………………………………

(**Note.—A report of privately owned mine rescue station should be made on a special form provided for that purpose.**)

55. **Accidents:**

a. **What has been the accident experience for the last 10 years on exposure and tonnage basis?** ……………………

Are accidents investigated? …………… **Method of reporting accidents** ……………………………………

……………………………………………………………

……………………………………………………………

……………………………………………………………

b. **Procure copy of accident records and accident costs, if possible, and discuss causes and give remedy for preventing each class of accidents** ……………………………………

……………………………………………………………

……………………………………………………………

……………………………………………………………

56. **Summary of safety conditions:**

a. **Stress points worthy of special commendation** ……………………

……………………………………………………………

……………………………………………………………

……………………………………………………………

b. **Give concise summary of conditions which appear unsafe**

……………………………………………………………

……………………………………………………………

……………………………………………………………

……………………………………………………………

(**Note.—Any features that bear upon safety and are out of the ordinary, whether in favor of or against safety, should be fully described.**)

RECOMMENDATIONS

Should be brief, numbered, and in accordance with previously stated facts.

Use introductory statement in recommendations proper that the carrying out of the following recommendations is believed vital to the safety of the mine. In general, where data as to mining practice are obtained from sources other than the investigator's own observation, it should be so indicated.

Inspector should obtain map of mine and have photostat copies made for inclusion in report.

ACKNOWLEDGMENT

Acknowledgment should be made of courtesies extended by officials.

Name of person making report:

……………………………………………………………

Title ……………………………………………………

Approved:

……………………………………………………………

Appendix.—Should include copies of dust- and air-analyses reports, map of mine, American Table of Distances for explosives magazine (if needed), and other notes of general interest.

Especial Note.—This outline is prepared to assist in the collection of data necessary to the writing of safety inspection reports, and it is believed that it covers most conditions found in and around coal mines. Although it is not expected that all of the data in the outline will be included in the report, all the data that it is possible to obtain are necessary to prepare a report intelligently. Detailed descriptions of methods, practices, and equipment are not essential unless there is some phase that has direct bearing on safety. The report should emphasize the hazards observed as well as call attention to unusually good practices.

APPENDIX G

TENTATIVE COAL-MINE INSPECTION STANDARDS

INTRODUCTION

These tentative coal mine inspection standards have been prepared as a guide for the Federal inspection of coal mines of the United States. Much time and thought have been spent by various members of the Safety Division in the preparation of these standards, and it is believed that compliance with them eventually will be possible in most mines. In many instances objections will be raised to them owing to long-established mining customs and practices that are inherently of dubious safety and to a natural inclination to oppose change. In other instances there will be valid objections due to conditions not foreseen at the time these standards were prepared. Or there may be substandard conditions and practices due to original mine layouts that it is not practicable to change during the lifetime of the mine; in such instances it is likely that some effective measures are or can be taken toward lessening hazards.

With the rapid change in mining methods some of the standards may become inapplicable and it may be advisable to revise them to meet the new conditions. Therefore, questions regarding these standards and suggestions regarding new standards should be brought to the attention of the supervising engineer of the Coal Mine Inspection Division so that modifications of and additions to these standards may be made from time to time.

In many respects these standards exceed the provisions of the various State mining laws, and some may conflict with the laws of some States. In cases of conflict, the intent is not to advocate noncompliance with State laws but to suggest that it may be desirable for the State to reconsider such laws or safety orders.

Although an effort has been made to word these standards so that they may be readily understood, nevertheless, a reasonable interpretation should be placed upon them. In fact, in numerous instances the words "reasonable", "suitable", and "properly" are used in recognition of the fact that reason and sound judgment enter into the carrying out of the safety endeavor.

The policy of the Bureau on some vitally important safety matters in mines is set forth in its published Safety Decisions. These decisions have been consulted and used in the preparation of these standards. These decisions also are now being reexamined by its Mine Safety Board.

SURFACE HAZARDS

1. General

1. All buildings within a radius of 100 feet of mine openings should be of fireproof or fire-resistant construction. If existing buildings within 100 feet of openings are not of fireproof or fire-resistant construction, fire doors should be erected at effective points where smoke or fire from outside sources may endanger men working underground. These doors should be tested for effectiveness at least every 3 months.

2. Adequate fire protection should be provided.

3. Fire hydrant couplings should be standard and interchangeable with municipal fire departments.

4. Fire-fighting equipment should be inspected and tested at least every 6 months and a record made of such inspections.

5. A fire-fighting organization should be maintained and fire drills held at least four times a year.

6. All surface buildings should be well illuminated, and heated where necessary.

7. Tight metal receptacles should be provided for oily waste.

8. Roads, paths, and walks should be kept free from obstructions. and should be well illuminated if used by night shift.

9. Timbers, ties, and other mine lumber, other than 1 day's supply should not be kept within 100 feet of mine opening or mine fan, and all materials, including rails, scrap iron, and other scrap, should be properly stored and piled so they will not obstruct roadways, will not present a stumbling hazard, or cannot roll or fall.

10. Electric wiring in all surface buildings should be installed so as to present no fire or contact hazards.

11. Wash houses should be provided and should be:

    (a) Kept clean and sanitary.
    (b) Provided with adequate toilet facilities.
    (c) Provided with at least two exits.
    (d) Well illuminated.

(e) Provided with clothes lockers or hangers.
(f) Kept well heated and if necessary, heating equipment guarded against contact hazard.
(g) Properly ventilated.
(h) Provided with adequate washing facilities.
(i) Provided with disinfectant foot bath in which the disinfectant is changed daily.

12. Supply houses:

(a) Material should be stored so that it will not fall or cause a stumbling hazard.
(b) Oil and grease should be stored in closed containers in a building separate from other materials.

13. Lamp house:

(a) Standard charging equipment should be used.
(b) Naphtha used for flame safety lamps should be stored in suitable containers, and only small amounts, preferably enough for 1 day's use, kept in lamp house.
(c) Only permissible flame safety lamps should be used.
(d) Flame safety lamps should be maintained by someone specifically assigned to that duty.
(e) Flame safety lamps should be properly cleaned, assembled and tested after each use. They should also be tested immediately before being taken underground.
(f) Charging equipment should be guarded and protected against shock hazard.

14. In handling railroad cars, brakemen should:

(a) Use suitable brake stick, preferably made of metal.
(b) Use safety belt.
(c) Wear safety hat.
(d) Use railroad type pinch-bar for shifting cars.
(e) Wear snug-fitting clothing.

15. While engaged in repair work in or around shafts, safety belts should be worn by all workmen. When a platform is being used, a second, or safety platform, should be placed not more than 10 feet beneath the working platform.

2. Tipple or Cleaning Plant

1. Electric motors used in tipples and cleaning plants should be dustproof.

2. All switches and starting boxes should be enclosed.

3. Open stoves or open-type heating devices should not be used in tipples or cleaning plants.

4. Coal dust should be cleaned thoroughly and frequently (preferably daily and at least once a week) from floor and ledges.

5. In tipples having a dust hazard and in dry cleaning plants, an air exhaust system should be used with dust collecting hoods located at the principal sources of dust, or dust should be allayed with water or other wetting agent.

6. Where coal is dumped at or near the intake air shaft, provision should be made to prevent the dust from entering the intake air or the main workings.

7. Surface stairways should not be set on an angle of more than 45° with the horizontal.

8. All stairways should be provided with safe hand rails and kept in good repair.

9. The treads of stairways should be of nonslipping construction, uniform, and kept in good repair.

10. At least 6-1/2 feet of head clearance should be provided over stairs.

11. Permanent ladders should be properly guarded.

12. All floor openings should be properly guarded with toe boards and rails.

13. All passageways and places where men must work should be well illuminated.

14. Men working around tipples or cleaning plants should wear goggles and, at dusty operations, they should wear suitable approved respirators.

15. Welding in tipples or cleaning plants should be done preferably when the plant is idle; in any event welding should not be done in a dusty atmosphere, and combustible surroundings should be wetted down before and after welding.

16. Where coal is treated with oil, men exposed to the oil mist should wear suitable approved respirators, and sources of ignition should be kept at safe distances from the oil spray.

3. Head Frame

1. A railed platform should be provided at head sheaves.

2. The stairway leading to the sheave platform should be provided with hand rail.

3. Sheaves should be inspected and oiled daily; they should not be operated during this procedure; a record should be made of this inspection. The oilman should advise the engineer in person when he has completed his job.

4. Machinery and Safety Appliances in connection therewith

(Surface and Underground)

1. Machinery and belting should be guarded adequately as indicated below:

   (a) All gears, sprockets, friction devices, and couplings with protruding bolts or nuts should be completely guarded.
   (b) All shafting and shaft ends longer than 2 inches within 6 feet of floor or platform level, should be completely guarded.
   (c) All vertical or inclined belts, chains, or rope drives should be suitably guarded to a height of 7 feet from the floor.
   (d) Horizontal belts, chains, or ropes within 7 feet of floor or platform should be guarded.
   (e) All fly wheels should be guarded. Where fly wheels are more than 6 feet high they should be guarded to a height of at least 6 feet.
   (f) All circular and band saws and planers should be adequately guarded.

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(g) Locomotive pits should be properly guarded and guard kept in place when the pit is not in use.

2. Hand tools should be kept in good condition.

3. Goggles should be provided, and men required to wear them when using grinding tools and when doing other work where particles are likely to fly. Preferably all mine employees should wear goggles at all times in and around mines. Where corrective lens goggles are indicated, they should be provided.

4. Welders and helpers should be provided with proper shields to protect their eyes.

5. All electric machines should be grounded according to the National Electrical Safety Code.

6. All rheostats and electric heaters should be adequately spaced away from combustible material or effectively shielded to eliminate fire hazards.

7. Light circuits and stationary machines should have suitable switches or circuit-breakers for cutting off current, and should be placed where they may be reached without danger of contact with moving parts.

8. All grinding wheels should be equipped with safety washers and substantial retaining hoods.

9. All surface machines should be illuminated adequately and safely.

10. Adequate clearance should be provided at machine installations, and passageways kept clear of stumbling hazards.

11. Good housekeeping should be practiced.

5. Mine Refuse Disposal

1. Burning waste dumps should be so located with reference to mine openings as to present no fire or fume hazard.

2. The waste dump should be fenced where there is a possible hazard to persons, especially children, or to animals.

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3. Mine waste disposal that presents a fire or slide hazard should be so placed as not to endanger mine or camp.

6. Surface Haulage

1. Track and roadbed should be maintained in good condition.

2. There should be clearance of 30 inches or more on at least one side of tracks, but if it is not practicable to obtain such clearance at some places these places should be marked with warning sign of impaired clearance.

3. Frogs and guard rails should be blocked to prevent persons from catching feet in them.

4. Positive hand-operated or automatic track switches should be provided.

5. Track switches should be provided with parallel throws and the bar extending from the track to the switch throw should be installed in such manner as to eliminate stumbling hazard.

6. Outside planes or inclines should have:

   (a) A positive stop block at the top.
   (b) A derail near the top.
   (c) A derail near the bottom.

7. An effective drag or equivalent positive mechanical device should be provided on all trips on mechanical or gravity planes or slopes.

8. Where surface operations require that many persons pass over the haulageway, a warning signal should be installed or an overhead walkway or underpass provided.

9. All track crossings should be provided with warning signs.

10. Crossings should be guarded while cars are being moved.

11. Derail devices should be installed on all side tracks near junctions with main lines.

7. Hoisting Equipment

1. Hoisting engines should be placed so that noise of other machinery will not prevent the engineer from hearing signals.

2. Hoists should be equipped with brakes able to stop and to hold the fully loaded unbalanced cage or trip of cars at any point in the shaft or incline. Sole dependence should not be placed upon a friction brake for holding a cage or trip while men are being loaded or unloaded.

3. Hoisting engineers should be physically fit and should undergo a physical examination at least annually to determine their continued fitness and physician's report of such examination should be posted.

4. Hoisting equipment should be inspected daily and a record made of such inspection.

5. The hoisting engine should be provided with positive overwind and overspeed devices.

6. At the beginning of each shift the hoisting engineer should slowly operate the cages up and down the shaft at least one round trip before hoisting or lowering men.

7. A second engineer should be in attendance at all times while men are being hoisted or lowered unless the hoist is equipped with automatic overwind and overspeed and automatic stop controls that are tested daily.

8. Drum guides or flanges should be high enough to extend at least 4 inches above rope at any time.

9. An accurate and reliable indicator of the cage or trip position should be so placed as to be in constant view of the engineer.

10. The rope should make at least three full laps on the drum when extended to its maximum distance and should make at least one full lap on the drum shaft and the end should be fastened securely by means of clamps.

11. The rope should be fastened to its load by a spelter-filled socket and bridle chains, or by a thimble and clamp and bridle chains, or other approved method.

12. A rope should not be used for hoisting men:

(a) Which shows more than six broken wires in any single pitch length or lay of rope.
(b) When the wires in the crown of the strand are worn to less than 65 percent of their original diameter.
(c) When inspection indicates a dangerous amount of corrosion or distortion.

13. A record should be kept of the length of service and tonnage hoisted of all hoisting ropes, and ropes should be replaced as soon as there is evidence of undue weakness or other conditions which indicate that the rope may fail.

14. Ropes, links, chains, and rope sockets should be examined carefully at least every 24 hours by a competent person, and a written report made of such inspections.

15. When men are transported in cars on outside planes or inclines:

(a) Special provision should be made, in addition to the coupling, to insure against accident should the rope or the coupling of any car break or become detached, or should the drawbar of any car break.
(b) They should be provided with level seats and hand holds.
(c) No tools, explosives, or other material should be carried in cars with men in the same trip.

16. Rollers used on slopes or inclines should be of sufficient length, properly alined, and kept in good repair.

17. At least two independent methods of signaling in shafts should be provided, one of which should be audible.

18. Signal devices at surface and intermediate landings should be located so they may be reached from the cage.

19. The signal code in use at the mine should be posted prominently in the engine room in easy sight of the hoisting engineer, and at all places where signals are given.

8. Cages and Shafts

1. Cages used for hoisting men should be of substantial construction, kept in good repair, and provided with:

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(a) Adequate steel bonnets.
(b) Sides of cage fully enclosed.
(c) Gates across ends, removable, if desired, when men are not being hoisted.
(d) Hand holds.
(e) Bridle chains.

2. Safety catches that act quickly and effectively in an emergency should be provided, and they should be tested at least every 2 months and a written record kept of tests.

3. Cages and guides should be inspected daily and a record kept of such inspections.

4. Any opening in the cage floor should be covered when men are being hoisted.

5. There should be a cager in charge at top and bottom of shaft when men are being handled.

6. Shafts should be equipped at top and intermediate landings, if any, with safety gates. The gates should be so constructed that materials will not go through or under them and into the shaft.

7. A positive stop block or derail should be placed at surface and intermediate shaft landing.

8. Tools or other material should not be carried in the cage with men. However, this should not apply to equipment and repair material requiring attendants.

9. Speed of cage when hoisting or lowering men should not exceed 900 feet per minute, or maximum speed specified by State law.

9. Steam Plant

1. Boilers should not be located less than 100 feet from any mine opening.

2. All boilers and stationary compressors should receive at least one internal inspection annually by an authorized inspector and a written record of such inspection should be kept.

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3. A safety valve escape or blow-off should not discharge lower than 7 feet off the floor and preferably the discharge should be piped to the outside of the building.

4. At least two safe means of exit from all parts of the boiler room should be available.

5. A stairway or fixed ladder should be provided to give easy access to the top of boilers or runways between boilers.

6. Compressors should be equipped with a fusible plug that will open at a temperature of 50° less than the flash point of the lubricating oil in use. This plug should be placed in the main discharge line as near the compressor as possible.

7. The main compressed air receiver should be equipped with safety or relief valve or valves.

8. Suitable gages should be provided for boilers and compressors (steam pressure, air pressure, water, etc.).

10. Surface Electric Equipment

1. Overhead transmission lines should be placed at least 15 feet above the ground and 20 feet above driveways and should be supported and guarded adequately to prevent contact with other circuits.

2. High potential power lines should be protected adequately by circuit breakers.

3. The wires of all circuits should be of ample capacity for the current carried.

4. Trolley wires should be kept at least 6-1/2 feet above the top of the rail and should be guarded at all regularly provided crossings. Wires 8 feet or higher above the rail need not be guarded.

5. Trolley wires should be taut, securely supported by enough insulated hangers to prevent sag, and placed at least 6 inches outside of one rail.

6. Transformers within 15 feet of the ground should be enclosed in a transformer house or by a substantial fence at least 6 feet high.

7. The gate or door to transformer station or fence should be kept locked at all times unless authorized persons are present.

8. DANGER-HIGH VOLTAGE signs should be placed on all transformer enclosures and high-tension switchboards.

9. Casings of all transformers should be grounded by the equivalent of No. O copper wire.

10. Switchboards should:

(a) Have ample working space around and back of them, free of rubbish and stored material.
(b) Have entrance at each end to permit authorized persons to inspect, adjust, or repair apparatus back of switchboard.
(c) Be adequately lighted.
(d) Have control readily accessible for emergency shutdown.
(e) Have cut-out switch on incoming circuit at or near entrance to rear.

11. Frames of all generators, motors, and switchboards, and metallic casings of cables carrying more than 300 volts should be grounded by the equivalent of No. O copper wire.

12. Dry wood platforms or mats of rubber or other electrically nonconducting material should be kept in place in front of all switchboards and at all electrical machinery where electric contact hazards exist.

13. Wires or other substitutes that do not provide adequate protection should not be used in place of approved fuses.

14. Guy wires from poles supporting wiring carrying high tension current should be efficiently grounded, and insulated between the ground and poles, near the poles.

15. Fire extinguishers approved for electrical fires should be available at all electric installations.

11. Surface Explosives

1. Surface explosives storage magazines should be:

(a) Constructed of incombustible material.

(b) Barricaded and located a safe distance from
the nearest building, highway, or mine entrance.
(refer to American Table of Distances.)
(c) Located a safe distance from waste dumps.
(d) Suitable danger signs nearby.
(e) Provided with properly screened ventilators.
(f) Kept locked securely at all times when not
being used.

2. If the explosives magazine is illuminated electrically, the lamps should be of vapor-proof type, the switch should be located outside the building, and wiring should be in conduit.

3. The area for at least 100 feet around the magazine should be kept free of dry grass and brush or other combustible material. Preferably, the ground around the magazine should be covered with cinders or gravel to prevent growth of grass.

4. Detonators should be stored in a separate magazine of incombustible material not less than 100 feet from the explosives storage magazine.

5. No material other than explosives should be stored in explosives magazines.

6. No material other than detonators should be stored in detonator magazines.

7. Magazines for distributing explosives should be constructed of incombustible material and situated a safe distance from the mine opening and other buildings, in accord with American Table of Distances. Preferably, they should be surrounded by a substantial fence which has a locked gate.

8. No more than 1 day's supply of explosives should be kept in the distributing magazine.

9. Unauthorized persons should not be permitted in the distributing magazine.

10. Only hardwood or nonsparking plastic tools should be used for opening boxes of explosives.

11. Waste paper and empty boxes should not be allowed to accumulate in storage or distributing explosives or detonator magazines.

12. No open lights, nonpermissible flashlights, or smoking should be allowed in storage or distributing magazines or in the handling of explosives or detonators.

13. Cases or kegs of explosives should always be lifted and set down carefully, never slid over one another nor dropped from one level to another.

14. Any motor vehicle or other vehicle used in surface transportation of explosives should be strong, substantial, and in good working order, preferably with a closed body with ends and sides high enough to prevent packages of explosives from falling or rolling off.

15. The batteries and wiring on motor vehicles used in hauling explosives on the surface should be located so as not to come in contact with packages of explosives, and wiring should be well insulated and fastened to prevent short-circuiting and fire.

16. State or other regulations as to marking explosives transporting equipment should be complied with. If no laws or regulations are in effect such vehicles should be placarded on each side and rear with the word EXPLOSIVES in letters not less than 3 inches high or should display a red flag with the word DANGER in white letters not less than 6 inches high.

17. Unauthorized persons should not be permitted to ride on equipment transporting explosives and the driver and helper should not smoke, or carry matches or lighters.

18. A truck or other vehicle containing explosives should never be left without first stopping the motor and setting the brakes securely and should never be taken into a garage or repair shop.

19. Explosives transported in a truck should never be left unattended until they are placed in a magazine and the magazine is locked, or are delivered to someone authorized to receive them.

20. Before unloading explosives from a truck, the motor should be stopped, and the packages should never be left immediately back of the exhaust as a spark may start a fire and cause an explosion.

21. Explosives should not be issued by company stores or otherwise to wives or children of miners or carried or otherwise handled by women or children.

22. Explosives should not be stored (even temporarily) in merchandising stores, in or near miners' homes, or in hoist rooms or other miscellaneous surface structures.

UNDERGROUND

NOTE: Wherever certified officials, such as certified shot firers, are mentioned in these standards, officials certified by the State are meant. If the State has no certification for such officials, they should be men well versed in the duties of their positions, through mining experience and training, and such positions should be designated in writing by the management. In the interest of safety, the Bureau of Mines believes that all mining States should require certification of mine officials.

12. General Practice

1. Air courses and accessible falls should be traveled at least once each week by a certified mine official, who should leave his initials and the date; if the air course is in such condition in any part or parts that it cannot be traveled, the defective condition or conditions should be remedied promptly.

2. Entrance to dangerous places should be fenced off, and a suitable danger sign placed.

3. A statement of all dangerous conditions should be recorded daily in a book signed and dated by the mine foreman, and countersigned by the superintendent.

4. Each working place should be inspected for safety by a certified official at least twice each working shift and at such more frequent periods as seem necessary and practicable. He should leave at or near the face of each place examined his initial and date.

5. Special company rules regarding mine safety should be adopted and published; they should be approved by the State agency governing mining where such approval can be obtained.

6. New employees should be fully instructed regarding the company safety rules and regarding the particular hazards incident to their work; this applies to both experienced and inexperienced personnel.

7. New employees should be furnished with a copy of the mine safety rules.

8. Employees should become conversant with the Mining Law with the aid of such instruction and assistance as may be obtained from the company or available educational agency.

9. The map of the mine should be brought up to date at least every 6 months and posted in a convenient place accessible to employees.

10. The map posted at the mine should show in addition to the mine workings:

(a) The direction of air currents passing through main headings, cross headings, and working places should be shown by arrows in colors.
(b) Locations of doors, overcasts, and regulators.
(c) Locations of telephones, power and trolley lines, and permanent electrical equipment.

11. The map should accurately show the thickness of barrier pillars around the boundary of the property.

12. When approaching abandoned workings which cannot be inspected or workings filled with water or gas, boreholes should be kept at least 20 feet in advance of the face, and similar 45° angle holes 25 feet deep in each side.

13. Machinemen, drillers, and loading machine operators (so far as possible) should not permit others near their machines while in operation.

14. At least two permissible flame safety lamps should be kept in proper working condition at every coal mine and at least two persons should be kept well informed as to the safe maintenance, testing, and use of flame safety lamps.

15. Drift or slope openings at the surface should be at least fifty (50) feet apart.

16. Protective hats should be worn by all employees, officials, and others while on duty in all parts of mines and also in work around mines where there is danger from falling objects.

17. Protective footwear should be worn by employees, officials, and others while on duty in and around mines.

18. Goggles should be worn, preferably at all times, by the men while they are on duty in and around mines, or at any rate while they are grinding, cutting, welding, and striking where particles are likely to fly.

19. Gloves should be worn when material is handled that may injure the hands. Gloves with long cuffs should not be worn unless material is being handled that may injure wrists, in which case the cuffs should be tight fitting.

20. Haulagemen and others who work around machinery should wear tight-fitting clothing and have trouser legs held with boots, puttees, tucked inside socks, or otherwise fastened.

21. The foreman or other person in charge of underground operations and all assistant foremen should have a certificate of competency from the State if the State issues such certificates.

22. A record of foremen's certificates should be kept at the mine.

23. Fire bosses, shot firers, drillers, cutting machine and mechanical loader operators should have a certificate of competency from the State department of mines if the State issues such certificates.

24. Idle or abandoned sections of the mine should be inspected for gas and other dangerous conditions by foreman or fire boss immediately before other employees are permitted to enter these sections.

25. Every underground mine should have not less than two openings or outlets to the surface that are connected with every seam of coal and from every lift and level thereof worked in such mine, except that it is not necessary that the two openings belong to the same mine if they afford safe escape or travel through either opening from either mine. However, such statement does not apply to opening new mines or new parts of mines in which not to exceed 20 persons should be employed on any one shift and that for the purpose of making a second opening.

26. Main slope and drift escapeways to the surface should be separated by at least 50 feet of natural ground throughout their length.

27. Escapeways should be readily accessible from every section of the mine and should be kept in a safe condition reasonably free from steam, dangerous gases, standing water, ice, and other obstructions.

28. Escapeways should be of sufficient height and width to allow men to travel safely.

29. Direction signs should be posted conspicuously to indicate manways and escapeways.

30. Where the escapeways are shafts:

(a) They should have incombustible walls or lining and be free of fire hazard from surface to bottom.
(b) They should be equipped with an independent hoist and cage, or with a travelable stairway.
(c) If equipped with stairway, it should be of substantial construction, set at an angle not greater than 45° with the horizontal, and equipped on at least one side with standard hand rail; landing platforms should be at least 2 feet wide and 4 feet long at easy and convenient distances (preferably not over 30 feet), and should be railed properly.
(d) If the shafts are not more than 30 feet deep, a ladder may be used in lieu of a stairway. Such ladders should be fastened securely and guarded properly. The rungs should be fastened securely, spaced equally, and not over 15 inches apart.
(e) Ladders or stairways should be kept in good repair with landings free of debris.

31. Where the escapeway is a slope of over 30°, it should be equipped with stairway or ladder, with landings at not to exceed 50-foot intervals.

32. Where the way of escape is a drift or slope which is inclined less than 45° from the horizontal, the incombustible walls, or lining, and freedom from fire hazard shall extend at least 200 feet from the entrance. Other escapeways also should have incombustible walls or be made fire resistant for 200 feet from the entrance or have incombustible walls and lining for 25 feet and fire doors. Fire doors should close automatically upon the release of a wire or rope.

33. When but one way of escape has incombustible walls or lining, it should be the normal intake airway.

34. All surface openings to underground workings that are not necessary for the operation of the mine or for escape and are not adequately ventilated, timbered, and regularly inspected, should be kept securely closed to prevent unauthorized persons entering and surface fires from extending underground, but they should be locked in such a way as not to prevent the escape of employees in an emergency.

35. All openings necessary for operation or escape should be guarded against the entrance of unauthorized persons.

36. A check-in-and-out system should be provided. In any event, identification checks should be provided that will positively identify each person entering the mine. The daily record in connection with the system should be kept in a place that will not be affected by an explosion in the mine.

37. All shaft linings should be fireproof and, so far as feasible, they should be smooth and without projections or recesses.

38. Oil and gas wells penetrating strata below beds of coal should be protected by a pillar of coal extending at least 50 feet on every side of the well bore.

39. If oil or gas wells penetrate open workings:

(a) A surrounding wall or pier of cement, masonry, or concrete should be constructed of a diameter exceeding the height of excavation, or at least 48 inches.
(b) The casing should be surrounded by an outer steel casing extending 20 to 30 feet below the coal bed, and open to the outside atmosphere for relief of any gas liberated.

40. Every oil or gas well that penetrates coal beds should be plugged properly with concrete for at least 10 feet above and below the coal bed when abandoned and the record filed with the State mining department.

41. All oil and gas wells should be indicated accurately on the mine map.

42. A 50-foot barrier pillar, or larger if deemed necessary, should be left when workings are adjacent to old workings suspected of containing bodies of dangerous gas. If the danger is from water the barrier pillar should be of such width as is determined by qualified engineers and approved by the proper State agency.

43. Strict compliance with mining laws and company safety standards should be demanded of all employees.

44. Machinery should not be repaired while it is in motion or oiled while it is in motion, except where such oiling can be done without danger to the oiler.

45. A guard or safety device removed from any machine should be replaced before the machine is put in operation.

46. An adequate supply and variety of tools should be available in working places, and these should be maintained in good condition.

47. Cutting machine, or mobile leader helpers, should travel at least 50 feet in advance of the machine going out of a working place onto haulageway and when traveling on haulage entries, or other precautions should be taken to avoid collisions.

48. Mining machines should not be loaded on their trucks or moved unless they are equipped with a safety chain or other adequate locking device.

49. Permissible electric cap lamps should be carried by all underground employees.

50. Not more than 2 days's supply of each kind of lubricating oil and grease should be stored at any one place in the mine at any one time.

51. Underground storage places for lubricating oil and grease should be of fireproof construction. Lubricating oil and grease in face regions or other working locations should be in closed metal containers.

52. Inside structures (substations, shanties, stables, pump rooms, etc.) should be constructed of incombustible material. Where the incombustible material is in contact with timber or coal it should not be of metal.

53. Underground stables should be constructed of incombustible material and be provided with steel fire doors at entrances.

54. Hay or straw should be stored in a fireproof structure apart from the stable.

55. Underground stables should be ventilated by separate splits of air, with vent to the return air course.

56. A separate run-around or passageway should be provided for travel at the foot of shafts and all intermediate landing. The run-around should not be less than 5 feet high and 3 feet wide.

57. At the foot of each slope there should be a refuge hole at least 10 feet deep, 4 feet wide, and 6 feet high.

58. The eyes of fire bosses, machinemen, mechanical loader operators, shot firers, and others who are required to test for gas should be in good condition or fitted with corrective-lens glasses.

59. To prevent injury from side slip of caterpillars from rail, the operator of caterpillar machine, when moving from place to place, should ride on the step provided for that purpose.

60. Barrier gates which close automatically should be provided on manways where they cross haulageways.

61. Pillar workings should be examined for explosive gas and other dangers before a cave or fill is made, and if gas is found in amounts that can be detected with a permissible flame safety lamp the cave or fill should not be made until gas is removed or, if removal of gas is not practicable, other precautions should be taken to safeguard all employees.

62. Drilling rock with percussion drills should be done wet. Men drilling rock with auger-type drills should wear approved type of respirators if dust is produced.

63. If axes are used underground, the handles should not be over 18 inches in length.

64. In coal beds pitching over 30°, a pillar of suitable thickness should be left below each level or gangway to be maintained.

65. Welding underground should be done in pure intake air, except that if welding is deemed necessary in return air, a certified official should be part of the welding crew and no welding should be done if methane is present in quantity of more than one-half percent. Especial precautions should be taken against the starting of a fire, particularly when the welding is done in a shaft or on the surface about the shaft collar.

13. Ventilation

1. Main fans should be:

(a) Installed on the surface.
(b) In a fireproof housing.
(c) Offset at least 25 feet from the line of any opening.
(d) Provided with ample pressure relief or explosion doors.
(e) Installed to permit prompt reversal of air flow.
(f) Provided with at least two independent sources of power immediately applicable, or a secondary fan unit if mine is gassy.

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(g) Operated continuously, except when mine is shut down.
(h) Provided with pressure recording gage.
(i) Provided with device to give alarm and cut off power automatically from mine when the fan slows down or stops.

2. Ventilating fans at isolated locations should be:

(a) Inspected daily.
(b) Attended constantly if not provided with automatic signal alarm and with remote control.

3. The area around fans, especially in isolated places, should be kept free of dry grass and brush or other combustible material for at least 100 feet.

4. Ventilating fans should be located so the return air from the mine cannot be pulled into the intake openings.

5. An auxiliary fan, preferably operated by an internal combustion or steam engine, should be provided when feasible, to serve in event of failure of the main fan.

6. A mine should be classed as gassy when methane or other combustible gas can be detected in amounts of as much as 0.25 percent or more by frequent, systematic search.

7. Intake air should be brought into the mine through a separate opening and not in an opening carrying both intake and return air separated by a partition.

8. Booster fans should not be used underground to increase the pressure on part of the total air flow.

9. Auxiliary fans or blowers with tubing should not be used in coal mines, except that they may be used to ventilate faces of rock tunnels being driven between two coal beds or through faults and wants. However, if used, they should be powered with permissible driving units and so located that recirculation of air is impossible.

10. Air in working places or travelingways should contain at least 20 percent oxygen, not more than 0.5 percent carbon dioxide, and no harmful amount of dust or poisonous gas.

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11. If the air of a working place contains more than 1 percent of inflammable gas, the place should be considered hazardous and to require improved ventilation immediately; if it contains more than 2 percent (slightly less than 1/2-inch cap on a testing or low flame), the workers should be withdrawn until ventilation has been improved.

12. If the air immediately returning from a split that ventilates any group of active workings contains more than 1/2 percent of inflammable gas, as determined by chemical analyses in duplicate or by other recognized means of accurate detection, the workings of that split shall be considered hazardous and require improved ventilation. If this air contains more than 1-1/2 percent of inflammable gas, the workers should be withdrawn until ventilation has been improved.

13. The quantity in cubic feet per minute of pure air in any split, circulated through the last open crosscut, should be not less than 200 times the number of men working in the section, and as much more as may be required.

14. The quantity of air reaching the last open crosscut on any pair of working entries, headings, or gangways, or the maximum inby point of a split should be at least 6,000 cubic feet per minute.

15. The quantity of air reaching the face of each working place should be at least 200 cubic feet per minute per man employed and as much more as may be necessary to dilute and carry away any inflammable or harmful gases that may be present.

16. All entries, rooms, panels, or sections that cannot be kept well ventilated throughout and regularly inspected, or that are not being used for coursing the air, travel, haulage, or the extraction of coal, should be sealed by strong, fireproof stoppings and provided with some means of bleeding-off the gas into the return.

17. Ventilation should not be shifted from idle or abandoned sections to active sections to provide an adequate quantity of air for different working shifts.

18. Break-throughs should be made not more than 80 feet apart.

19. Stoppings between intake and return of all main haulageways should be constructed of substantial incombustible material except that one temporary stopping of wood or brattice cloth may be erected between the last permanent stopping and the face of entries. These stoppings should be completed promptly as the passageways are advanced. On branch haulageways stoppings should be of substantial construction and of incombustible or fire-resistant material with the exception near face as above.

20. Stoppings in room crosscuts should be of gob wall, dirt, or tight board, preferably gunited or plastered, except that canvas may be used in the last open crosscut in connection with line brattice.

21. Not more than one crosscut should be left open between the faces of entries and the first outby temporary or permanent stopping.

22. A split ventilation system utilizing air crossings should be used instead of doors for conducting ventilation in all main passageways.

23. Where doors are used in connection with coursing the air in any one split or if used in lieu of a slpit ventilation system they should be:

(a) Installed in pairs to form air locks or, where this is not feasible, tight check curtains, well-maintained, should be hung in connection with single doors.
(b) Self-closing.
(c) Not provided with latches or other devices to hold them open.
(d) Provided with a small glass or clear plastic window, except that when check curtains are used in connection with haulage through single doors an automatic signal should be provided to give positive evidence when door is open.
(e) Provided with a supply of rock dust on each side for fire emergency use if doors are of wood.
(f) Hung so that they swing to the clearance side.
(g) Hung so as to open against the ventilating current.

24. Overcasts should be tight and of noncombustible material and should be so arranged as to pass the required quantity of air.

25. Trap-doors placed in stoppings should be so hinged or constructed as to be self-closing, tight, and open against the air current.

26. Line brattice should be:

(a) Used to conduct the air from the last open breakthrough to working faces when necessary to remove gases, explosives fumes, and smoke and dust.
(b) Constructed with boards at bottom and otherwise secured to provide the most adequate air movement possible and convey sufficient ventilation to the face.
(c) Be of mildew- and fire-resisting material.

27. The space on the intake side of line brattices should be large enough (approximately 3 feet in width) to permit free flow of air and this space should be kept clean; posts should be on the wide side of the brattice, and the space on the return side should also permit free flow of air.

28. Rooms, chambers, breasts, or chutes should not be worked off an entry heading or gangway in advance of the last break-through, even if line brattices are utilized. This does not apply to the driving of such places to make a connection at the first crosscut, counter, monkey drift, or similar passageway used as a main airway in connection with a gangway or entry. It does apply to extending such places beyond the airway before the main intake and return passageways are connected ahead of the room, chamber, breast, or chute.

29. Places should not be worked on an air current that has passed through abandoned workings or pillar lines that cannot be inspected regularly. It is hazardous to work in places using air currents from partly caved workings.

30. Airways should be kept clear to permit free passage of air; this includes nonhaulage air courses as well as those utilized for haulage or man-travel.

31. Changes in ventilation affecting the mine as a whole or splits thereof should be made when the mine is idle and with no men in the mine other than those engaged in changing the ventilation.

32. Should the main fan fail or stop for 5 minutes or more in a gassy mine (gassy mine being defined by Bureau of Mines Safety Decision 33) the men should be withdrawn immediately from the mine. After the fan has been started the mine should be examined thoroughly for gas and any gas found should be removed before the men re-enter. The same procedure should be followed in a section of a gassy mine if it is ventilated by a booster fan and there has been more than momentary stoppage of such fan.

33. Should the main fan of a nongassy mine (mine in which frequent systematic searches find less than 0.25 percent of methane as per Safety decision 33) fail or stop for more than 30 minutes the men should be withdrawn immediately from the mine. After the fan has been started the mine should be examined thoroughly for gas and any gas found should be removed before men re-enter.

34. If stoppage of main fan is more than momentary, mine electrical power should be cut off from face sections and if stoppage is for 5 minutes or more power should be cut off from the entire mine. A thorough gas examination should be made before power is restored.

35. Permissible methane detectors should be used for making inspections for explosive gas. Permissible flame safety lamps are considered a type of premissible methane detector.

36. When not in service, all methane indicators or detectors and flame safety lamps should be placed in the custody of a competent person responsible for their maintenance and testing.

37. All men required to use methane indicating devices or flame safety lamps should be thoroughly instructed in their use and limitations.

38. All coal mines classed as nongassy should be carefully inspected for methane at least once a month.

39. Enough firebosses should be employed in gassy mines; they should:

(a) Begin examination of the mine not more than 3 hours before each shift enters the mine.
(b) Examine every working place, all places adjacent to live workings, every roadway travelway, every unfenced road to abandoned workings, and all accessible falls in the mine for explosive gas and other hazards.
(c) Leave at or very close to the face of each place examined his initials and the date.
(d) Place a danger signal across the entrances to every place where explosive gas can be detected by a flame safety lamp or where other danger is found.
(e) Report to the foreman any dangers found before the men enter the mine.
(f) Record the result of his inspection in a book kept on the surface for that purpose.
(g) Indicate on a bulletin board near the mine entrance the places where gas was found or other dangerous conditions were observed.

40. No electrically driven permissible equipment should be taken into or operated in any place if methane can be found by a flame safety lamp or permissible methane detector in amount of more than 2.00 percent in the general air of the place. Such test for methane should be made not nearer than 4 feet from the face and 10 inches from the roof.

41. No electrically driven machine operating in face regions in a gassy mine should run more than 30 minutes without an examination for gas being made; in very gassy places or those in disturbed strata such as during a squeeze, the gas examinations should be spaced not more than 15 minutes apart.

42. Haulage and hoisting openings and main haulageways should be kept on intake air.

43. In every sealed area one or more stoppings should be fitted with pipe and valve to allow sampling of air behind seals. Relief of excess pressure should be made through pipes leading into the return or this pressure relief may be secured by boreholes to the surface.

44. The mine forman or his designated assistant on each shift should read and countersign the fire boss' reports of examination preliminary to that shift before men enter the mine. The mine foreman should read and countersign daily the assistant foreman and fire boss' reports.

45. Air measurements should be made by the mine foreman, his assistants, or other certified official, at least once each week at or near the mouth of the main intake and return of the mine and also in or immediately adjacent to the last crosscut on each air split. Tests should be made with flame safety lamp or other methane indicator in such splits and in the main return. A record of these measurements and tests should be kept in a book furnished for this purpose.

46. Smoking should not be permitted in any mine.

47. Search of employees for smoking material, matches, and other lighting devices should be made frequently and in a manner to assure that such articles are not being carried into the mine.

48. Accumulations of gas should be removed under the direct supervision of a foreman or other competent official, and men should not work and nonpermissible electrical equipment should not be operated, on the return of the split while gas is being removed.

49. When electric power has been off a mine or section for 4 hours or more, the mine or section should be examined for gas, and if gas is detected the power should not be turned on again until the gas has been removed. However, this is not intended to bar operation of a single unit such as a pump on a properly fused branch line if examination has been made with flame safety lamp and no gas is found at pump surroundings.

14. Explosives and Blasting Devices

1. Receptacles or boxes used to carry explosives into mines should be closed and constructed substantially of nonconductive material.

2. Bodies of cars used for transporting explosives underground should be designed for that purpose and constructed substantially of nonconductive material, and should be fully insulated, including the couplings.

3. Where feasible, the supply of explosives should be delivered on the off shift or between shifts.

4. Explosives should not be carried on the same trip with workmen.

5. Trips carrying explosives should not be operated at the same time man-trips are operated.

6. Explosives and detonators should be transported and kept in separate containers.

7. Explosives and detonators for use at working faces should be stored in individual containers in niches in the rib not less than 15 feet apart and at least 100 feet back from the working face; not more than one day's supply should be stored in these locations. In pillar or stump work or in places where it is not practicable to cut niches in the rib for storage of explosives, the foreman should designate safe places where explosives may be stored.

8. If underground storage boxes or magazines are provided, they should be:

(a) Placed in a crosscut or abandoned room neck as far away from the roadway as possible and at least 25 feet from trolley or power wires, and in a comparatively dry place.
(b) Kept locked at all times except when in use.
(c) Protected from falls of roof.
(d) Constructed substantially and, if of metal, with electrically nonconducting lining.

9. No more than a 24-hours' supply of explosives or detonators, including any surplus remaining from the previous day, should be stored underground. To avoid deterioration of explosives the older explosives should be used first so that none of the explosives in storage shall be in the mine more than 24 hours before firing use.

10. Only permissible explosives or permissible blasting devices should be used, and these should be used in a permissible manner as follows:

(a) Not more than 1-1/2 pounds in any one shot.
(b) Fired only with electric detonators of proper strength.
(c) Fired with a permissible shot-firing device.
(d) Shall not be fired on the solid.
(e) Stemmed with incombustible material.

However, in anthracite mines where it is not feasible to cut or shear the coal, and therefore, uneconomical to break the coal with a limit charge of 1-1/2 pounds to any one shot, permissible explosives should be used owing to the greater factor of safety it affords compared with other types of explosives.

11. Shots should be charged and fired by certified shot firers, other certified officials, or authorized persons.

12. If the coal is cut, boreholes should not be drilled until after the undercut, topcut, or shear is made.

13. Boreholes should be drilled at least 6 inches less than the depth of the cut or shear.

14. Boreholes should be cleaned properly before the charge is placed in the hole.

15. Shot firers should refuse to charge or fire improperly placed holes.

16. Dependent shots or shots having insufficient or excessive burden should not be fired.

17. Explosives should not be brought to the face while any electrical equipment is in operation at or near the face.

18. Each primer should be made up at or near the face immediately before loading and in a place removed from wiring and rails.

19. Explosives should be tamped tightly with clay or other incombustible stemming, preferably to the collar of the hole, but in no instance should the stemming be less than 2 feet in length.

Also, in anthracite mines stemming can be construed to mean any type of plug used in lieu of stemming when the use of same does not deduct from the breaking efficiency of the explosive, create a harmful amount of noxious gases, or permit a blown-out shot.

20. Only wood tamping bars, wood tamping bars tipped with hard rubber, or hard rubber bars should be used.

21. Leg wires of electric blasting caps should be kept shunted until ready to connect to the firing cable.

22. A blasting cable should be:

(a) At least 100 feet long.
(b) Kept shunted at the blasting end until ready to attach to the blasting unit, or otherwise protected from stray currents and electrically energized agencies.
(c) Wound up after each shot or adequately supported on timbers or rib.
(d) Kept away from track, power wires, pipe lines, or other possible sources of active or stray currents.

23. Bare spots on a blasting cable should be insulated properly as soon as observed.

24. The firing ends of a blasting cable should be staggered as to length.

25. Only permissible firing devices should be used unless blasting is being done from the outside with all men out of the mine: Provided, that in anthracite mines, other than permissible firing devices may be used in rock tunnels, rock crosscuts, and rock chutes if methane is not present in hazardous amounts.

26. Shots should not be fired from the power or signal circuit while any men are in the mine.

27. A shot should not be fired when more than 1 percent of methane is known to be present.

28. Roof and face of working places should be tested before, and the roof should be tested and the place examined for fire after, firing a shot.

29. The simultaneous firing of several shots with men in the mine should be allowed only if blasting is done entirely in a permissible manner, that is, with a permissible firing device, limitation of 1-1/2 pounds of explosive to the shot, and shots not dependent, etc.

30. Shots should be fired prompty after charging.

31. Shots should not be fired in rapid succession, except that delay detonators may be used in anthracite mines.

32. Examination for gas should be made before and after firing a shot or simultaneous shots in a gassy mine.

33. Misfires should be handled under the supervision of a certified official.

34. Misfires due to defective detonators or defective leg wires within the hole should be handled by firing a separate shot at least 2 feet away from and parallel to the misfire, or by carefully washing any stemming out of the hole with a hose and inserting new primer. If a separate shot is fired careful search should be directed toward recovery of undetonated explosive and detonator.

35. Adobe (mudcap) or other open, unconfined shots should not be fired in any bituminous or lignite coal mine.

In anthracite mines adobe or other open, unconfined shots may be fired to start running of coal in chutes but only if it is not possible to start the coal running otherwise and there is no gas or fire hazard. Permissible explosives only should be used in such shots.

36. Ample warning should be given before shots are fired; this applies to Cardox and Airdox blasting as well as to the ordinary types of explosives.

37. An accurate record should be kept of:

(a) The amount of explosives and detonators taken into and returned from the mine.
(b) The number of misfired shots.
(c) The number of blown-out shots.
(d) Any holes the shot firer refuses to charge or fire.
(e) The total number of shots fired, including misfired, blown-out, or burned-out shots.

38. Undercut, topcut, and shear should be reasonably free of machine cuttings and excess water before shooting.

39. Cardox charging stations should:

(a) Be located in a fireproof structure on the surface.
(b) Be located a safe distance from other structures.
(c) Have all electrical equipment properly grounded.
(d) Have permanent storage tank located outside the building.
(e) Be provided with at least two methods of relieving excess pressure in the storage tank. If one of these methods is a valve, the valve should be tested monthly.
(f) Have heating elements stored in a separate magazine on the surface. The magazine should comply with requirements for storage of other explosives.

40. Cardox shells should be transported underground in insulated cars or in insulated boxes placed in ordinary mine cars.

41. A well-insulated wire should be used for the connection to the insulated or "hot" terminal of a Cardox shell. A new piece of wire should be used for the connection of each blast; the wire may be used a second time for the grounded connection of the shell.

42. The ends of Cardox shell wired should be "shorted" before the "hot" wire is attached, and should not be untwisted until ready to attach the shooting cable.

43. Cardox shells should be wired at the working face only and never when leaning against a drill truck or other machinery.

44. Cardox should not be shot off the solid or in a "tight" shot.

45. All Cardox shots should be stemmed to the collar of the hole.

46. Everyone should be in a safe place, preferably around more than one corner, before shooting Cardox.

47. In the use of both Cardox and Airdox after the coal in a working place has been broken down examinations should be made for loose or dangerous roof by a certified official. In the case of a gassy mine a certified official should also examine for gas.

The following 18 recommendations apply to the use of Airdox:

(1) When installed on the surface airdox compressors should be in a separate fireproof building. Underground compressor stations for Airdox, as far as fireproof housing and ventilation requirements are concerned, should conform to previous recommendations in these Standards.

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(2) Compressor motor should be protected with proper compensated starting and overload relays.

(3) Compressed air should be conducted from compressor to within practical working distance of the face by steel tubing tested to a pressure of 20,000 pounds per square inch.

(4) As far as practicable steel air tubing should not be installed in haulage or other regularly traveled entries.

(5) All air lines should be grounded properly.

(6) Suitable unions should be installed on all lines of steel tubing at not less than 400-foot intervals.

(7) A cutoff valve should be installed in all branch lines close to main air line and also at inby end of all steel air lines.

(8) No air lines, either steel or copper, should be handled or repaired while air pressure is in the line.

(9) All copper air lines should be equipped with shutoff valves.

(10) Shooting or release valves should not be less than 45 feet from the face and should be located around at least one 90° angle corner with the center line of place in which coal is being broken down.

(11) After the breaking down of coal in any one place has been completed the shell should be disconnected immediately from the air line.

(12) When release valve is opened to discharge shell it should remain open until ready to charge shell in next hole.

(13) Dust in drill holes should be removed by washing out with water, or other effective method.

(14) When shooting coal, holes should not be drilled on the solid or in the roof. The shell should be pushed to the back of the drill hole, then withdrawn far enough to form an air cushion.

(15) When a break-through or crosscut is being made all men in the place to which such break-through or crosscut is being driven should be removed a safe distance from the working face before Airdox is released.

(16) When the pillar between working places is less than ten (10) feet in thickness all men must be removed a safe distance from the face of adjoining working place before Airdox is released.

(17) Steel or copper air tubing should be insulated with a suitable insulating material when crossing trolley or other electric wires or when crossing under rails.

(18) All pressure tanks and lines should be blown out at least once a week, or more often if necessary to prevent any accumulations of oil or moisture.

15. Electricity Underground

1. Air in which nonpermissible mining equipment and electrical wiring is used should not contain more than 1/2 of 1 percent methane as determined by analysis or other recognized means of accurate detection of methane. In addition, such equipment and wiring should not be used in air from areas that might liberate dangerous explosive gas. Also if methane can be found in excess of 2 percent in holes in the roof of any working place by analysis or by methane indicator (flame safety lamp or electrical indicator) nonpermissible electrical equipment should not be taken into or operated in the working place until the pocket of gas has been removed by additional ventilation.

2. Permissible equipment should be maintained in good state of repair and in permissible condition, as determined by a rigid examination each week by a person well informed in the safe use of electricity underground and in the maintenance of equipment; a record should be kept of the defects found and how they were remedied. Repairs should not be made, nor the electrical parts opened at or near the face, while the power is on the machine or cable.

3. All electrical appliances, machines, and conductors should be sufficient in size and power for the work they may be called upon to do.

4. All metallic coverings and armor of cables should be continuous electrically and should be grounded effectively.

5. All metallic frames, casings, and coverings of motors, generators, transformers, switchboards, and other stationary equipment that can become "alive" through failure of insulation or by contact with live parts, should be grounded permanently and effectively.

6. Where a grounded return system is used, all underground metallic pipe lines 1,000 feet in length or over, and all metallic pipe lines leading outside the mine, should be bonded to the return at the ends and also at intervals not exceeding 500 feet.

7. All metallic pipe lines and conduits in shafts and boreholes should be grounded permanently at top and bottom of the shaft or borehole.

8. The frames of drills and other electrical tools intended to be held in the hands while being operated should be grounded.

9. No potential higher than 250 volts should be used for operating drills or any other electrical tool intended to be held in the hands. Electric drills or other tools held in the hand should have the electric switch so constructed as to shut off the current when the hands release it.

10. Underground electric stations should be in rooms of fireproof construction. Fireproof doors should be provided and arranged to close automatically in case of fire. Electric stations include transformer installations, pumps, motor-generator sets, and charging stations.

11. Underground stations having transformers filled with inflammable oil should be provided with a door sill, or its equivalent, that will confine the oil to the room in case of leakage.

12. Clean, dry sand or rock dust and fire extinguishers, suitable from both toxic and shock standpoint, should be provided and placed outside of underground electric stations, so as to be out of the smoke of a fire in the station.

13. Underground storage battery charging stations should be placed on a separate air split.

14. Insulated mats or platforms should be used in front of all switchboards, and starting switches of all permanent underground electrical equipment.

15. Trolley and bare power wires should be:

(a) Securely supported on insulated hangers not more than 30 feet apart.
(b) Kept taut and not permitted to touch the roof, rib or crossbars, or door frames.
(c) Properly alined and placed at least 6 inches outside the rail.
(d) Located on opposite side from rooms and refuge holes and clearance side.
(e) Sectionalized by proper switches at intervals not exceeding 2,500 feet, and switches should be placed near the beginning of all branch lines.

(f) Provided with sectionalizing switches at points where loaded mine cars are stored on idle days.
(g) Adequately guarded where the wire is less than 6-1/2 feet above the top of the rail.
(h) Adequately guarded and sectionalized at man-trip stations.
(i) Cut-off and fastened with an insulated turnbuckle at inby end.

16. In gassy mines, high voltage transmission cables should be of armored or other suitable type, and the armor should be electrically continuous throughout and effectively grounded.

17. Power should be disconnected when repair work is being done on electrical equipment, and accessories such as trailing cable, feed wire, trolley wire, switches, junction boxes, and the like.

18. Power wires should be properly guarded on both sides of all doors for a distance of at least 16 feet.

19. Power wires, other than trolley wires, should be properly insulated when passing through doors or stoppings; trolley wires should be protected from contact with doors or door frames.

20. Power wires, whether bare or insulated, should be supported on, or by well designed and installed insulators and not by nailing them on timbers, or similar slipshod methods.

21. The end of trolley or feed wires should not be extended beyond the last open break-through or crosscut and should be kept at least 150 feet from the end of pillars, workings, or any open, partly caved, poorly ventilated places.

22. Power should be cut off idle sections of a mine and cut off from the mine itself on idle days when feasible. This statement is not, however, intended to bar the use of properly fused branch lines for the operation of single units such as pumps if pump and surroundings are examined with flame safety lamp and found free of gas before cutting on branch line.

23. All underground electrical equipment should be provided with switches of safe design, construction, and installation.

24. All officials, haulage crews, electricians, and others connected with electrical maintenance should be instructed as to locations of cut-out switches.

25. All cut-out switches should be marked legibly so as to be found readily in case of emergency.

26. Enough circuit-breakers should be provided to protect all power circuits. If they are automatic, they should be set so that the circuits cannot be overloaded; if they are hand-set the handles should not be tied in place.

27. All underground electrical equipment should be protected against excessive overload by fuses or equivalent protective devices, of the correct type and capacity.

28. Wiring in underground structures should be insulated and installed properly.

29. Telephone connections should be provided from the surface to within a few hundred feet of all working sections of the mine and should be kept always available for service.

30. Telephone wires should be installed on the opposite side from power or trolley wires.

31. Telephone wires crossing power or trolley wires should be adequately insulated.

32. Telephones should have suitable fuses or be otherwise protected to prevent becoming charged in excess of the power used on the telephone system.

33. If track is used for the return circuit, both rails should be well bonded at every joint and cross-bonded at least every 200 feet.

34. Signal wires should not carry in excess of 24 volts.

35. Signal wires should be supported to prevent sagging or short circuiting by contact or otherwise.

36. In gassy mines permissible junction or distribution boxes should be used in making power connections at working faces.

37. Cables for portable or semiportable underground electrical equipment should be provided with fused nips, or taps, unless suitably arranged for connecting to permissible junction or distribution boxes.

38. Temporary cable splicing should be made in a workmanlike manner, electrically continuous, mechanically strong, and insulated. With a defective cable, it is preferable to use a standby cable and send the defective cable to the shop for adequate, safe repair.

39. Cables with temporary splices should not be kept in service more than 24 hours.

40. Permanent cable splicing should be done in surface or underground repair shops by proper splicing and vulcanizing.

41. To prevent excessive heating, the trailing cables of equipment used in conveyor mining should be suspended in long loops, rather than tightly coiled.

42. Instructions in artificial respiration should be posted at every electric station and at or near the entrance to the mine.

43. All employees working with or around electrical equipment should know how to give artificial respiration.

44. A plan or map should be kept showing the location of all stationary electrical equipment and all permanent wiring.

45. Electric lights on the slope or shaft bottom should be on a separate circuit from the trolley circuit.

46. Lighting circuits should be fused safely and effectively.

47. Lighting wires should be supported by suitable insulators, connected to the trolley or power line with clamps, and should not be wrapped or tied about the stem or stud of trolley hangers.

48. The ground connection for lighting wires taken off the trolley circuit should be made to the track circuit.

49. Incandescent lights should be placed so that they cannot come in contact with combustible material, particularly timber, caps, or posts.

50. Incandescent lamps should not be used at or near any working face unless of portable permissible storage battery type.

51. Incandescent lamps on haulageways should be recessed in the roof or rib or shielded to prevent glare.

52. Lamp sockets with exposed metal parts should not be used underground.

16. Control of Coal Dust and Rock-Dusting

1. Coal dust should not be permitted to accumulate on roadways, along conveyor lines, and on gob, rib, roof or timbers.

2. If machine cuttings are of a character that would contribute to an explosion, they should be loaded out; in general, it is desirable that any machine cuttings containing coal should be loaded and hauled out of the mine.

3. Coal should not be used for track ballast.

4. Mine cars should be constructed and maintained dust-tight.

5. Coal should be so loaded that it will not spill off during transportation.

6. Water or wetting solutions should be used for allaying coal dust:

   (a) On the cutter bar or cutting chain of mining machines, or sprayed on the dust as it emerges from the kerf.
   (b) Before and after blasting.
   (c) On the coal pile before and during loading, if hand-loading into car or on conveyor is done.
   (d) On the coal pile before and during loading, if loading by "duckbill" or scraper.
   (e) On mobile loading machines.
   (f) At the unloading head of conveyors or scrapers.
   (g) On loaded and empty trips.
   (h) In the face region and back to the last application of rock dust.
   (i) At underground dumps.

7. All coal mines, except anthracite mines (whether in wet or dry condition), should be kept thoroughly rock-dusted, in all open, unsealed places to at least within 40 feet of the face. The dust should be distributed upon the top, bottom, and sides.

8. Loose coal and coal dust should be cleaned up before applying rock dust.

9. Rock dust should be applied and maintained in such quantity that the incombustible content will not be less than 65 percent.

10. When methane is present in the ventilating current, the 65-percent minimum percentage of incombustible should be increased 1 percent for each 0.1 percent methane.

11. Sampling should be done monthly to determine whether redusting is needed.

12. A record should be kept showing the location of the places of sampling, the results of the analyses, and the amount of rock dust applied monthly as well as annually.

17. Haulage

1. Haulage roads should be kept clean of coal spillage, coal dust, and debris.

2. Rails should be of sufficient weight to carry safely the heaviest rolling stock and should be firmly attached to ties of adequate size, number, and spacing.

3. On all haulage roads, rail joints should be plated or welded and be well supported by ties placed immediately under the joints.

4. The track should be properly alined and should be free from high or low joints, broken rails, defective switches, defective frogs, and defective frog alinment.

5. Road bed should be kept well drained and surfaced.

6. Frogs and guard and lead rails should be well blocked.

7. Switches should be complete with parallel throws and bridle bars.

8. The rod extending from the rail to the switch throw should be covered or otherwise protected.

9. Switch throws should be placed on the clearance side.

10. Incandescent electric lights should illuminate all switches located in pure intake air.

11. Internal combustion engines for driving locomotives, pumps, etc., should not be used underground.

12. Steam locomotives should not be used underground.

13. Where two or more locomotives are operating on the same track, a block or telephone signal system should be used to control movement of locomotives. This should not be construed as preventing use of locomotives in tandem or the use of more than one locomotive with one trip.

14. Pushing of cars should be eliminated insofar as possible; trips should not be pushed on main haulageways except at partings or under some emergency.

15. Sprags, chains, or car blocks should be used on all standing cars regardless of grade. If cars have brakes, they also should be set.

16. Use of chips or small pieces of wood, pieces of coal or rock or similar makeshifts should not be considered as adequate blocking.

17. An effective drag, or equivalent positive mechanical device, should be used on all trips ascending grades in excess of 3 percent.

18. On all inside slopes and planes having a knuckle, there should be a positive action safety block at or above the knuckle.

19. A positive stop block, or derail, should be placed below the switch of the first active working place on all producing entries going to the rise.

20. On producing entries going to the dip, a positive stop block or derail should be placed just above the switch to the first active working place and a stop block should be placed just below the switch to the last active working place.

21. When coal is not being loaded in a room or entry face and, nevertheless, men are working therein, a positive stop block or derail should be placed across the room or entry track to prevent cars inadvertently from being pushed into place.

22. Slides or skids should be used on descending grades where locomotive is not adequate to control trip.

23. Each locomotive should have an efficient headlight and gong or other effective signal.

24. Locomotive headlight bulbs should not be supported by waste or other combustible material.

25. An efficient trip light should be placed on the rear of all trips and on the front of cars being pushed. Permissible type trip lights should be used in gassy mines. Reflector buttons should not be substituted for trip lights.

26. On all trolley haulageways there should be a continuous clearance on the side opposite the trolley wire of at least 30 inches from the nearest obstruction to the farthest projection of moving equipment.

27. On the trolley wire side, there should be a clearance of at least 12 inches from the nearest obstruction to the farthest projection of moving equipment.

28. At side tracks there should be a clearance of at least 30 inches between the farthest projection of equipment on any two tracks.

29. Shelter holes should be available along all haulageways; they should be suitably marked and not over 60 feet apart on the clearance side, not more than 4 feet wide and not less than 5 feet deep, and 6 feet in height or as high as the traveling space if it is less than 6 feet.

30. Shelter holes should be kept clean and free from loose material, and other obstructions.

31. Room necks and crosscuts complying with the above standards should be considered as shelter holes even though wider than 4 feet.

32. Shelter holes should be made at all switch throws.

33. Shelter holes should be provided on both sides of all doors.

34. Clearance should not be obstructed by loose rock or coal, supplies or other material.

35. Only authorized persons should operate locomotives.

36. Locomotives and cars should be handled carefully and kept under control at all times.

37. A system of signals should govern movement of trips.

38. Riding on locomotives should be prohibited except to those operating the trip and persons authorized by management.

39. Riding on top of loaded cars, between cars, on trolley wire side of cars, or on bumpers in front of cars should be prohibited. Riding on outside of cars should be prohibited, except to those operating the trip.

40. Motormen or brakemen should not get on or off cars or trips in motion.

41. When the motorman leaves the locomotive temporarily, the reverse lever on the controller should be set at neutral, and brakes set tightly; if the lever is removable, it should be removed.

42. Backpoling should be allowed only at places where trolleypole cannot be reversed and at very slow speed of locomotive.

43. "Nipping" should not be permitted.

44. Flying switches should be prohibited.

45. At least two cars should be placed between the locomotive and cars or trucks carrying rails or long timbers.

46. An interval of at least 500 feet should be maintained between locomotives traveling in the same direction; and the locomotives should be held to a low speed.

47. Cars should not be coupled by hand while they are in motion.

48. **Cars** should not be coupled by hand from the inside of curves.

49. Locomotives approaching and passing through doors should be operated at reduced speed for at least 100 feet on each side of the door.

50. Locomotives should be equipped with suitable rerailers, jacks, and other necessary tools for rerailing cars or locomotives.

51. Short pieces of rail, ties, or props should not be used to raise or slue derailed cars and locomotives.

52. Cars and trips should not be left standing in a place where they will endanger other trips or persons.

53. Motormen, brakemen, and drivers should not leave ventilating doors or curtains standing open while placing or gathering cars.

54. Cars and trips should not be left standing where they may obstruct the ventilating current.

55. Man trips should be in charge of an official who should accompany the trip.

56. The speed of man trips should not exceed 6 miles per hour. Man trips should be under the control of the motorman at all times.

57. Man trips should not be operated behind loaded trips on ascending grades, nor in front of loaded trips on descending grades.

58. Enough cars should be provided on man trips to permit all men to ride inside and prevent crowding.

59. Men on man trips should not ride in the car next to a trolley locomotive.

60. When riding in a car on a trolley haulage road, men should ride on the side of the car opposite the trolley wire if there is any danger of men coming in contact with trolley wire.

61. No person other than brakeman should be permitted to ride on the rear bumper of a man trip, and no person should be allowed to ride between cars.

62. The man trip should come to a full stop before men load and unload.

63. A suitable place with seats should be provided at junction points where men may congregate while waiting for man trip; it should be where lives of persons waiting would not be jeopardized by a runaway car or trip or the wrecking of car or trip.

64. No material except tools and other supplies that can fit inside a separate car should be hauled on the man trips; no explosives should be carried on the man trip.

65. A car should be provided for tools and tools should not be permitted in the man trip in any car with men.

66. At man trip loading and unloading stations, the power should be cut off the trolley wire while men are loading or unloading; also the wire should be adequately guarded at those stations.

67. All haulage employees and others who work around machinery while wearing electric cap lamps should conceal the cables of their lamps under their clothing and should wear tight-fitting clothes with trouser legs in boots or puttees, or otherwise fitted snugly.

68. Haulage equipment should be maintained in safe condition.

69. Room hoists should not be worked beyond their capacity; their ropes should not be used to replace derailed cars; and the rope should be attached or coupled only to the drawbar of the car.

70. When a room hoisting rope has a broken strand, it should not be used until repaired.

18. Timbering

1. Systematic timbering rules and outlines should be provided.

2. Timbering rules should be strictly enforced.

3. An adequate supply of props, timbers, and prepared cap pieces and wedges should be provided at places convenient to faces or other point of use.

4. Miners and other face employees should examine their working places thoroughly and make them safe before beginning work.

5. Every underground worker should be instructed in the vibration method of testing roof.

6. Exposed roof in every working face should be tested at frequent intervals when workers are at or near the face.

7. Mining-machine and loader operators should be provided with suitable roof testing bars, and should test roof and sides, and any dangerous condition should be remedied before operation is begun. The machine should be stopped while roof and sides are being tested.

8. Officials should test exposed roof in working places visited and roof along haulageways and manways with a special roof testing rod; condition of timbering should also be observed.

9. Loose coal, slate, or rock in haulageways and manways should be removed or supported securely as soon as practicable.

10. Overhanging ribs or brows should be taken down or supported effectively.

11. Before taking down loose roof a careful examination should be made of the adjacent roof, and if the conditions in any way warrant it a temporary post or posts should be set first.

12. If loose slate or other roof material is being pried down a bar not less than 4 feet long should be used instead of a pick.

13. Where conditions make it at all practicable to use a safety post this post or posts should be set before coal loading is begun.

14. Before safety posts are removed a careful inspection should be made of the roof and, where necessary, additional timber set. If any safety posts are removed before additional timber is set a long bar or rail rather than a hammer or axe should be used in removing posts.

15. Where there is danger of coal rolling upon a person it should be spragged after undercutting or center-cutting, by placing blocks in the cut, not over 4 feet apart, or by blocking with leaning posts.

16. In slopes or inclined shafts and in main haulageways, posts supporting the roof or sides should be hitched into the rib or wall. If this is not practicable, substantial guard rails should be placed along or spacers between the posts.

17. No post should be set without an adequate cap piece.

18. Cap pieces should be at least 18 inches long, 3 or more inches thick, and at least as wide as the top of the post, and where practicable, should be made of soft wood.

19. In hand-loading places where permanent crossbars are required, temporary timbers should not be extended more than the distance of one "cut" of coal beyond the last permanent crossbar.

20. In mechanical loading places where temporary crossbars are required to be set close to the face, such temporary crossbars should not be removed until permanent crossbars have been set to replace them; no more than two "cuts" of coal should be removed beyond the last permanent crossbar.

21. Miners or other employees should not go under draw slate or other loose roof material until it is made safe.

22. Broken and rotten timbers should be replaced as soon as possible.

23. Timber removed by cutting-machine or loading-machine operators or timber knocked out by shooting should be replaced as soon as possible.

24. Timbers should be recovered only by mechanical means, by men experienced in such work and under the direct supervision of an official.

25. In pillar work, breakline posts or cribs should be maintained at all times at the loose ends of pillars and stumps.

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19. Safety Organization

1. A safety engineer or director should be employed for mines employing 100 or more persons.

2. In mines employing 100 or more persons, the safety engineer or director should have no duties to perform other than looking after the safety of the employees. He should report to the higher officials (general superintendent, general manager, or president) and should have authority to correct unsafe conditions where the hazard is great; otherwise he should call attention of officials to the hazards.

3. In small mines (those employing fewer than 100 persons) an official such as foreman, assistant foreman, face boss, etc., may also serve as the safety engineer or director.

4. A safety organization of officials and employees should be established.

5. Joint safety meetings of men and officials should be held at least monthly.

6. A bulletin board and suitable bulletins should be provided and the bulletins should be changed from time to time and kept interesting and up-to-date.

7. All accidents should be investigated and a record kept of such investigations.

8. Responsibility for accidents should be placed when it is feasible to ascertain such responsibility.

9. When feasible, a safety committee, including workmen and officials, should make periodic inspections of the mine and submit recommendations for correcting hazards observed.

10. A record should be kept of all lost-time accidents, and they should be summarized monthly as well as annually and studied with a view to making needed corrections in practice.

20. First Aid and Mine Rescue

1. All employees (underground and surface) should be given first-aid training as soon as possible after being employed.

2. Where feasible, additional first-aid training should be given all employees annually.

3. Adequate first-aid material should be provided on the surface and underground, and kept in clean, usable condition.

4. A selected number of men should be trained in mine rescue work, at least 12 men for any mine employing more than 100 men whenever such training facilities are available.

5. Additional mine rescue training should be given monthly if training facilities are available.

6. Mine officials should take the Bureau of Mines Advanced Mine Rescue Course when such course is available.

7. Mine rescue equipment should be provided if the mine does not have access to State-owned equipment or is not a member of a central rescue station.

8. Underground employees should have self-rescuers.

9. If employees have self-rescuers, they should be trained in their use and self-rescuers should be tested at frequent intervals by immersion in hot water.

APPENDIX H

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

INSPECTION REPORT OF NONCOMPLIANCE ITEMS

(Please mail this report immediately to Washington Office, Employment Statistics Section)

Mine code No..........
Name of mine ....
Location of mine: State .... County .... Town ....
Name of operator ....
Address of operator ....
Date of inspection ....

Surface Hazards
Card Number

(Mine inspector will indicate noncompliance items by placing a red check mark above appropriate code numbers. Example: $\overset{\checkmark}{(01\text{–}01)}$ 12. Use red pencil or red ink.)

(1) General (01)	(01–01)	(01–02)	(01–03)	(01–04)	(01–05)	(01–06)	(01–07)	(01–08)
	12	13	14	15	16	17	18	19
	(01–09)	(01–10)	(01–11)	(01–11A)	(01–11B)	(01–11C)	(01–11D)	
	20	21	22	23	24	25	26	
	(01–11E)	(01–11F)	(01–11G)	(01–11H)	(01–11I)	(01–12)	(01–12A)	
	27	28	29	30	31	32	33	
	(01–12B)	(01–13)	(01–13A)	(01–13B)	(01–13C)	(01–13D)	(01–13E)	
	34	35	36	37	38	39	40	
	(01–13F)	(01–14)	(01–14A)	(01–14B)	(01–14C)	(01–14D)	(01–14E)	(01–15)
	41	42	43	44	45	46	47	48
(1) Tipple and Cleaning Plant (02)	(02–01)	(02–02)	(02–03)	(02–04)	(02–05)	(02–06)	(02–07)	(02–08)
	51	52	53	54	55	56	57	58
	(02–09)	(02–10)	(02–11)	(02–12)	(02–13)	(02–14)	(02–15)	(02–16)
	59	60	61	62	63	64	65	66
(1) Head frame (03)	(03–01)	(03–02)	(03–03)					
	69	70	71					
(2) Machinery (04)	(04–01)	(04–01A)	(04–01B)	(04–01C)	(04–01D)	(04–01E)	(04–01F)	
	12	13	14	15	16	17	18	
	(04–01G)	(04–02)	(04–03)	(04–04)	(04–05)	(04–06)	(04–07)	(04–08)
	19	20	21	22	23	24	25	26
	(04–09)	(04–10)	(04–11)					
	27	28	29					
(2) Mine Refuse Disposal (05)	(05–01)	(05–02)	(05–03)					
	32	33	34					
(2) Surface Haulage (06)	(06–01)	(06–02)	(06–03)	(06–04)	(06–05)	(06–06)	(06–06A)	(06–06B)
	37	38	39	40	41	42	43	44
	(06–06C)	(06–07)	(06–08)	(06–09)	(06–10)	(06–11)		
	45	46	47	48	49	50		
(2) Hoisting Equipment (07)	(07–01)	(07–02)	(07–03)	(07–04)	(07–05)	(07–06)	(07–07)	(07–08)
	53	54	55	56	57	58	59	60
	(07–09)	(07–10)	(07–11)	(07–12)	(07–12A)	(07–12B)	(07–12C)	(07–13)
	61	62	63	64	65	66	67	68
	(07–14)	(07–15)	(07–15A)	(07–15B)	(07–15C)	(07–16)	(07–17)	(07–18)
	69	70	71	72	73	74	75	76
	(07–19)							
	77							
(3) Cages and Shafts (08)	(08–01)	(08–01A)	(08–01B)	(08–01C)	(08–01D)	(08–01E)	(08–02)	
	12	13	14	15	16	17	18	
	(08–03)	(08–04)	(08–05)	(08–06)	(08–07)	(08–08)	(08–09)	
	19	20	21	22	23	24	25	

Surface Hazards—Continued

Card Number								
(3) Steam Plant (09)	(09–01) 28	(09–02) 29	(09–03) 30	(09–04) 31	(09–05) 32	(09–06) 33	(09–07) 34	(09–08) 35
(3) Surface Electric Material (10)	(10–01) 38	(10–02) 39	(10–03) 40	(10–04) 41	(10–05) 42	(10–06) 43	(10–07) 44	(10–08) 45
	(10–09) 46	(10–10) 47	(10–10A) 48	(10–10B) 49	(10–10C) 50	(10–10D) 51	(10–10E) 52	
	(10–11) 53	(10–12) 54	(10–13) 55	(10–14) 56	(10–15) 57			
(3) Surface Explosives (11)	(11–01) 60	(11–01A) 61	(11–01B) 62	(11–01C) 63	(11–01D) 64	(11–01E) 65	(11–01F) 66	
	(11–02) 67	(11–03) 68	(11–04) 69	(11–05) 70	(11–06) 71	(11–07) 72	(11–08) 73	(11–09) 74
	(11–10) 75	(11–11) 76	(11–12) 77	(11–13) 78	(11–14) 79	(11–15) 80		
(4) **Surface Explosives** (Cont.) (11)	(11–16) 12	(11–17) 13	(11–18) 14	(11–19) 15	(11–20) 16	(11–21) 17	(11–22) 18	

Underground

(4) **General Practice** (12)	(12–01) 21	(12–02) 22	(12–03) 23	(12–04) 24	(12–05) 25	(12–06) 26	(12–07) 27	(12–08) 28
	(12–09) 29	(12–10) 30	(12–10A) 31	(12–10B) 32	(12–10C) 33	(12–11) 34	(12–12) 35	
	(12–13) 36	(12–14) 37	(12–15) 38	(12–16) 39	(12–17) 40	(12–18) 41	(12–19) 42	(12–20) 43
	(12–21) 44	(12–22) 45	(12–23) 46	(12–24) 47	(12–25) 48	(12–26) 49	(12–27) 50	(12–28) 51
	(12–29) 52	(12–30) 53	(12–30A) 54	(12–30B) 55	(12–30C) 56	(12–30D) 57	(12–30E) 58	
	(12–31) 59	(12–32) 60	(12–33) 61	(12–34) 62	(12–35) 63	(12–36) 64	(12–37) 65	(12–38) 66
	(12–39) 67	(12–39A) 68	(12–39B) 69	(12–40) 70	(12–41) 71	(12–42) 72	(12–43) 73	(12–44) 74
	(12–45) 75	(12–46) 76	(12–47) 77	(12–48) 78	(12–49) 79	(12–50) 80		
(5) **General Practice** (Cont.) (12)	(12–51) 12	(12–52) 13	(12–53) 14	(12–54) 15	(12–55) 16	(12–56) 17	(12–57) 18	(12–58) 19
	(12–59) 20	(12–60) 21	(12–61) 22	(12–62) 23	(12–63) 24	(12–64) 25	(12–65) 26	
(5) **Ventilation** (13)	(13–01) 29	(13–01A) 30	(13–01B) 31	(13–01C) 32	(13–01D) 33	(13–01E) 34	(13–01F) 35	
	(13–01G) 36	(13–01H) 37	(13–01I) 38	(13–02) 39	(13–02A) 40	(13–02B) 41	(13–03) 42	
	(13–04) 43	(13–05) 44	(13–06) 45	(13–07) 46	(13–08) 47	(13–09) 48	(13–10) 49	(13–11) 50
	(13–12) 51	(13–13) 52	(13–14) 53	(13–15) 54	(13–16) 55	(13–17) 56	(13–18) 57	(13–19) 58
	(13–20) 59	(13–21) 60	(13–22) 61	(13–23) 62	(13–23A) 63	(13–23B) 64	(13–23C) 65	
	(13–23D) 66	(13–23E) 67	(13–23F) 68	(13–23G) 69	(13–24) 70	(13–25) 71	(13–26) 72	
	(13–26A) 73	(13–26B) 74	(13–26C) 75	(13–27) 76	(13–28) 77	(13–29) 78	(13–30) 79	(13–31) 80

Underground—Continued

(6) Ventilation (Cont.)

Card Number								
(13)	(13-32)	(13-33)	(13-34)	(13-35)	(13-36)	(13-37)	(13-38)	(13-39)
	12	**13**	**14**	**15**	**16**	**17**	**18**	**19**
	(13-39A)	(13-39B)	(13-39C)	(13-39D)	(13-39E)	(13-39F)	(13-39G)	
	20	**21**	**22**	**23**	**24**	**25**	**26**	
	(13-40)	(13-41)	(13-42)	(13-43)	(13-44)	(13-45)	(13-46)	(13-47)
	27	**28**	**29**	**30**	**31**	**32**	**33**	**34**
	(13-48)	(13-49)						
	35	**36**						

(6) Explosives and Blasting Devices

(14)	(14-01)	(14-02)	(14-03)	(14-04)	(14-05)	(14-06)	(14-07)	(14-08)
	40	**41**	**42**	**43**	**44**	**45**	**46**	**47**
	(14-08A)	(14-08B)	(14-08C)	(14-08D)	(14-09)	(14-10)	(14-10A)	
	48	**49**	**50**	**51**	**52**	**53**	**54**	
	(14-10B)	(14-10C)	(14-10D)	(14-10E)	(14-11)	(14-12)	(14-13)	
	55	**56**	**57**	**58**	**59**	**60**	**61**	
	(14-14)	(14-15)	(14-16)	(14-17)	(14-18)	(14-19)	(14-20)	(14-21)
	62	**63**	**64**	**65**	**66**	**67**	**68**	**69**
	(14-22)	(14-22A)	(14-22B)	(14-22C)	(14-22D)	(14-23)	(14-24)	
	70	**71**	**72**	**73**	**74**	**75**	**76**	
	(14-25)	(14-26)	(14-27)	(14-28)				
	77	**78**	**79**	**80**				

(7) **Explosives and Blasting Devices** (Cont.)

(14)	(14-29)	(14-30)	(14-31)	(14-32)	(14-33)	(14-34)	(14-35)	(14-36)
	12	**13**	**14**	**15**	**16**	**17**	**18**	**19**
	(14-37)	(14-37A)	(14-37B)	(14-37C)	(14-37D)	(14-37E)	(14-38)	
	20	**21**	**22**	**23**	**24**	**25**	**26**	
	(14-39)	(14-39A)	(14-39B)	(14-39C)	(14-39D)	(14-39E)	(14-39F)	
	27	**28**	**29**	**30**	**31**	**32**	**33**	
	(14-40)	(14-41)	(14-42)	(14-43)	(14-44)	(14-45)	(14-46)	(14-47)
	34	**35**	**36**	**37**	**38**	**39**	**40**	**41**
	(14-48)	(14-48A)	(14-48B)	(14-48C)	(14-48D)	(14-48E)	(14-48F)	
	42	**43**	**44**	**45**	**46**	**47**	**48**	
	(14-48G)	(14-48H)	(14-48I)	(14-48J)	(14-48K)	(14-48L)	(14-48M)	
	49	**50**	**51**	**52**	**53**	**54**	**55**	
	(14-48N)	(14-48O)	(14-48P)	(14-48Q)	(14-48R)			
	56	**57**	**58**	**59**	**60**			

(7) Electricity Underground

(15)	(15-01)	(15-02)	(15-03)	(15-04)	(15-05)	(15-06)	(15-07)	(15-08)
	63	**64**	**65**	**66**	**67**	**68**	**69**	**70**
	(15-09)	(15-10)	(15-11)	(15-12)	(15-13)	(15-14)	(15-15)	
	71	**72**	**73**	**74**	**75**	**76**	**77**	
	(15-15A)	(15-15B)	(15-15C)					
	78	**79**	**80**					

(8) Electricity Underground (Cont.)

(15)	(15-15D)	(15-15E)	(15-15F)	(15-15G)	(15-15H)	(15-15I)		
	12	**13**	**14**	**15**	**16**	**17**		
	(15-16)	(15-17)	(15-18)	(15-19)	(15-20)	(15-21)	(15-22)	(15-23)
	18	**19**	**20**	**21**	**22**	**23**	**24**	**25**
	(15-24)	(15-25)	(15-26)	(15-27)	(15-28)	(15-29)	(15-30)	(15-31)
	26	**27**	**28**	**29**	**30**	**31**	**32**	**33**
	(15-32)	(15-33)	(15-34)	(15-35)	(15-36)	(15-37)	(15-38)	(15-39)
	34	**35**	**36**	**37**	**38**	**39**	**40**	**41**
	(15-40)	(15-41)	(15-42)	(15-43)	(15-44)	(15-45)	(15-46)	(15-47)
	42	**43**	**44**	**45**	**46**	**47**	**48**	**49**
	(15-48)	(15-49)	(15-50)	(15-51)	(15-52)			
	50	**51**	**52**	**53**	**54**			

Underground—Continued

Card Number

(8) Control of Coal Dust and Rock Dusting

(16)	(16–01) 57	(16–02) 58	(16–03) 59	(16–04) 60	(16–05) 61	(16–06) 62	(16–06A) 63	(16–06B) 64
	(16–06C) 65	(16–06D) 66	(16–06E) 67	(16–06F) 68	(16–06G) 69	(16–06H) 70	(16–06I) 71	
	(16–07) 72	(16–08) 73	(16–09) 74	(16–10) 75	(16–11) 76	(16–12) 77		

(9) Haulage

(17)	(17–01) 12	(17–02) 13	(17–03) 14	(17–04) 15	(17–05) 16	(17–06) 17	(17–07) 18	(17–08) 19
	(17–09) 20	(17–10) 21	(17–11) 22	(17–12) 23	(17–13) 24	(17–14) 25	(17–15) 26	(17–16) 27
	(17–17) 28	(17–18) 29	(17–19) 30	(17–20) 31	(17–21) 32	(17–22) 33	(17–23) 34	(17–24) 35
	(17–25) 36	(17–26) 37	(17–27) 38	(17–28) 39	(17–29) 40	(17–30) 41	(17–31) 42	(17–32) 43
	(17–33) 44	(17–34) 45	(17–35) 46	(17–36) 47				
	(17–37) 48	(17–38) 49	(17–39) 50	(17–40) 51	(17–41) 52	(17–42) 53	(17–43) 54	(17–44) 55
	(17–45) 56	(17–46) 57	(17–47) 58	(17–48) 59	(17–49) 60	(17–50) 61	(17–51) 62	(17–52) 63
	(17–53) 64	(17–54) 65	(17–55) 66	(17–56) 67	(17–57) 68	(17–58) 69	(17–59) 70	(17–60) 71
	(17–61) 72	(17–62) 73	(17–63) 74	(17–64) 75	(17–65) 76	(17–66) 77	(17–67) 78	(17–68) 79
	(17–69) 80							

(10) Haulage (Cont.)

(17)	(17–70) 12

(10) Timbering

(18)	(18–01) 16	(18–02) 17	(18–03) 18	(18–04) 19	(18–05) 20	(18–06) 21	(18–07) 22	(18–08) 23
	(18–09) 24	(18–10) 25	(18–11) 26	(18–12) 27	(18–13) 28	(18–14) 29	(18–15) 30	(18–16) 31
	(18–17) 32	(18–18) 33	(18–19) 34	(18–20) 35	(18–21) 36	(18–22) 37	(18–23) 38	(18–24) 39
	(18–25) 40							

(10) Safety Organization

(19)	(19–01) 43	(19–02) 44	(19–03) 45	(19–04) 46	(19–05) 47	(19–06) 48	(19–07) 49	(19–08) 50
	(19–09) 51	(19–10) 52						

(10) First Aid and Mine Rescue

(20)	(20–01) 55	(20–02) 56	(20–03) 57	(20–04) 58	(20–05) 59	(20–06) 60	(20–07) 61	(20–08) 62
	(20–09) 63							

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